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A Continuing Bibliography with Indexes

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AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

(Supplement 316)

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA scientific and technical information system and announced in October 1988 in

- *Scientific and Technical Aerospace Reports (STAR)*
- *International Aerospace Abstracts (IAA).*

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INTRODUCTION

This Supplement to *Aerospace Medicine and Biology* lists 146 reports, articles and other documents announced during October 1988 in *Scientific and Technical Aerospace Reports (STAR)* or in *International Aerospace Abstracts (IAA).* The first issue of the bibliography was published in July 1964.

In its subject coverage, *Aerospace Medicine and Biology* concentrates on the biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the Earth's atmosphere or in interplanetary space. References describing similar effects of biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. In general, emphasis is placed on applied research, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion.

Each entry in the bibliography consists of a bibliographic citation accompanied in most cases by an abstract. The listing of the entries is arranged by *STAR* categories 51 through 55, the Life Sciences division. The citations, and abstracts when available, are reproduced exactly as they appeared originally in *IAA* or *STAR,* including the original accession numbers from the respective announcement journals. The *IAA* items will precede the *STAR* items within each category.

Seven indexes — subject, personal author, corporate source, foreign technology, contract, report number, and accession number — are included.

An annual index will be prepared at the end of the calendar year covering all documents listed in the 1988 Supplements.

Information on the availability of cited publications including addresses of organizations and NTIS price schedules is located at the back of this bibliography.

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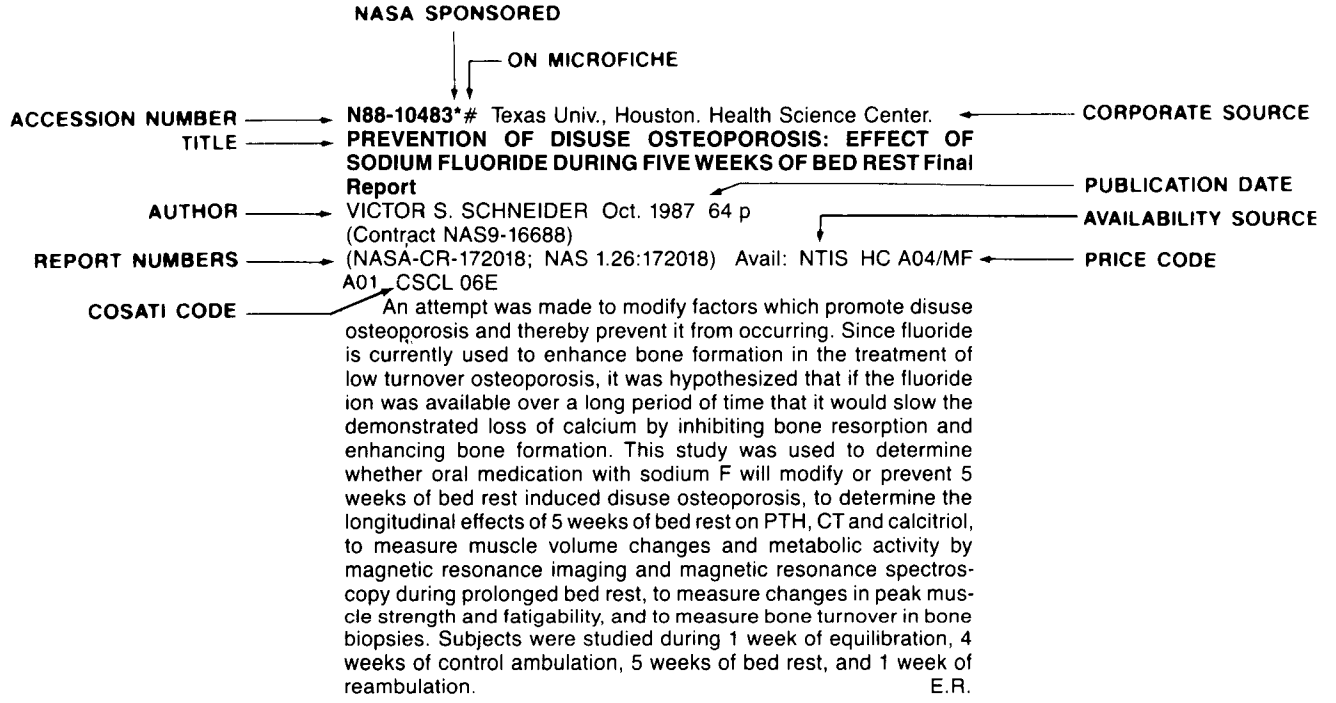
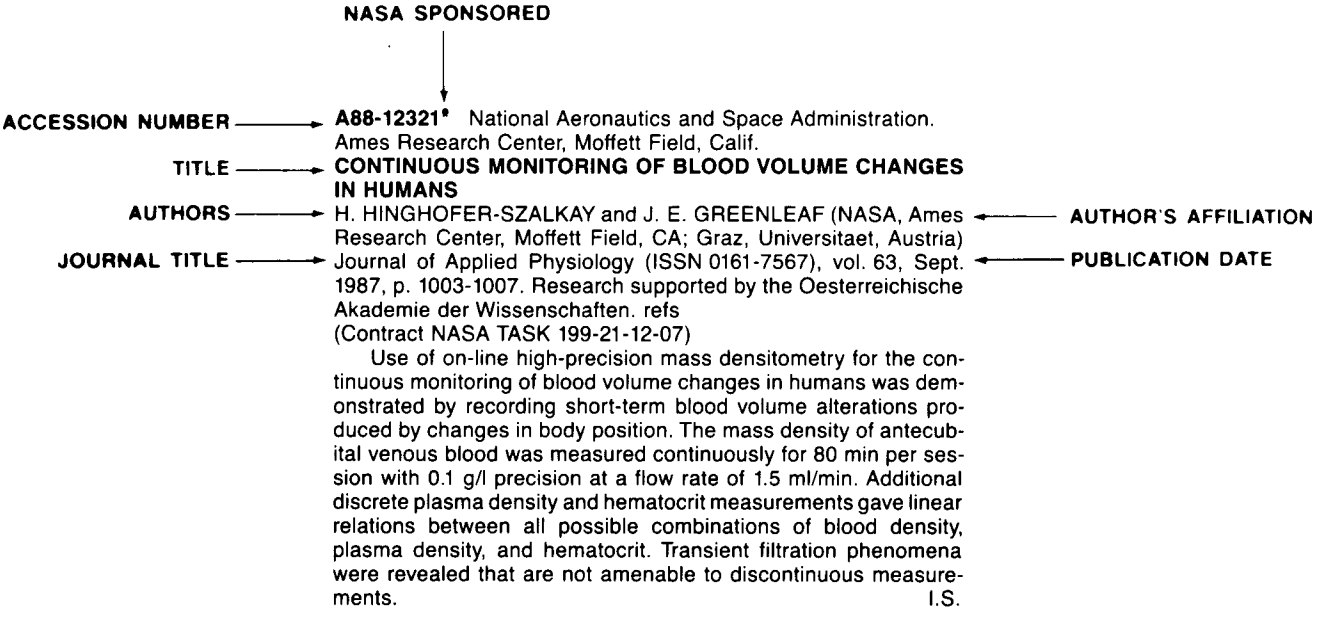
TYPICAL REPORT CITATION AND ABSTRACT



TYPICAL JOURNAL ARTICLE CITATION AND ABSTRACT



AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 316)

NOVEMBER 1988

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LIFE SCIENCES (GENERAL)

A88-46919
SELECTIVITY OF THE TAMIAS SIBIRICUS STRIATAL CORTEX NEURONS (FRONTAL FIELD OF VIEW) TO THE CONTRAST POLARITY AND THE DIRECTION OF VISUAL-STIMULUS MOTION [SELEKTIVNOST' NEIRONOV STRIARNOI KORY BURUNDUKA /FRONTAL'NOE POLE ZRENIIA/ K POLIARNOSTI KONTRASTA I NAPRAVLENIIU DVIZHENIIA ZRITEL'NYKH STIMULOV]
E. V. POLKOSHNIKOV and I. S. CHETYRBOK (AN SSSR, Institut Evoliutsionnoi Morfologii i Ekologii Zhivotnykh, Moscow, USSR) Akademiia Nauk SSSR, Doklady (ISSN 0002-3264), vol. 300, no. 5, 1988, p. 1260-1263. In Russian. refs

A88-47319
EFFECT OF ALVEOLAR HYPOXIA ON PULMONARY FLUID FILTRATION IN IN SITU DOG LUNGS
L. A. HOMIK, Z. BSHOUTY, R. B. LIGHT, and M. YOUNES (Manitoba, University, Winnipeg, Canada) Journal of Applied Physiology (ISSN 0161-7567), vol. 65, July 1988, p. 46-52. Research supported by the Manitoba Health Research Council and Canadian Heart Foundation. refs

The effect of alveolar hypoxia on fluid filtration in dog lungs was investigated using an in situ left-upper-lobe preparation with near static flow conditions, at which hydrostatic pressure could be controlled and measured. The rate of edema formation was estimated either over a wide range of vascular pressures under 0.95 and 0.0 inspired-O2-fraction, FI(O2), conditions (with 5-percent CO2-N2 balance in both cases) or at a constant vascular pressure of 40 mm Hg under four FI(O2) conditions: 0.95, 0.21, 0.05, and 0.0. There was no change in the slope of the plot of the rate of edema formation vs vascular pressure at two extremes of FI(O2), and no significant difference in the rate of edema formation with changing FI(O2) condition at a particular vascular pressure, indicating that alveolar hypoxia has no effect on the threshold pressure for edema formation. I.S.

A88-47321
EFFECTS OF PULSED ELECTROMAGNETIC FIELDS ON NA(+) FLUXES ACROSS STRIPPED RABBIT COLON EPITHELIUM
C. S. COLLIS and M. B. SEGAL (Saint Thomas's Hospital, London, England) Journal of Applied Physiology (ISSN 0161-7567), vol. 65, July 1988, p. 124-130. Research supported by Saint Thomas's Hospital Endowments. refs

A88-47322
ALTERED ANGIOTENSIN-CONVERTING ENZYME IN LUNG AND EXTRAPULMONARY TISSUES OF HYPOXIA-ADAPTED RATS
SUZANNE OPARIL, ANNIE JO NARKATES, ROBERT M. JACKSON, and HYUNG SOO ANN (Alabama, University, Birmingham) Journal of Applied Physiology (ISSN 0161-7567), vol. 65, July 1988, p. 218-227. Research supported by the American Lung Association and USVA. refs
(Contract NIH-HL-22544; NIH-HL-35051)

A88-47325* California Univ., Los Angeles.
ADAPTATION OF BONE AND TENDON TO PROLONGED HINDLIMB SUSPENSION IN RATS
ARTHUR C. VAILAS, DIANE M. DELUNA, LISA L. LEWIS, SANDRA L. CURWIN, ROLAND R. ROY (California, University, Los Angeles) et al. Journal of Applied Physiology (ISSN 0161-7567), vol. 65, July 1988, p. 373-376. refs
(Contract NCA2-IR-390-501; NCA2-IR-390-502)

The effect of a sustained deprivation of ground reaction forces on mineralized and soft connective tissues was investigated in rats subjected to 28-d-long hind-limb suspension. The results of morphological and biochemical studies carried out on femurs and patellar tendons obtained from suspended and nonsuspended 110-d-old rats showed that prolonged suspension led to an increase of the minimum diameter of the femur middiaphysis (by 12 percent), without any significant alterations in cortical area, density, mineral and collagen concentrations, femur wet weight, length, and DNA and uronic acid concentrations. However, in the patellar tendons of suspended rats, the collagen and proteoglycan concentrations were 28 percent lower than in tendons obtained from nonsuspended animals. These results suggest that ground reaction forces are important for the maintenance of cortical bone and patellar tendon homeostasis during weight-bearing conditions. I.S.

A88-47947
X-RAY STRUCTURE OF A DNA HAIRPIN MOLECULE
RAJAGOPAL CHATTOPADHYAYA, SATOSHI IKUTA, KAZIMIERZ GRZESKOWIAK, and RICHARD E. DICKERSON (California, University, Los Angeles) Nature (ISSN 0028-0836), vol. 334, July 14, 1988, p. 175-179. NSF-supported research. refs

The crystal structure of a synthetic DNA hexadecanucleotide of sequence C-G-C-G-C-G-T-T-T-T-C-G-C-G-C-G-C-G has been resolved at 2.1 A resolution and is observed to adopt a monomeric hairpin configuration with a Z-DNA hexamer stem. In the T4 loop the bases stack with one another and with neighboring molecules of the crystal, and not with base pairs of their own hexamer stem. Two thymine T10 rings from different molecules stack between the C1-G16 ends of a third and a fourth hairpin helix, in a manner that suggests T-T base 'pairing' and simulates a long, 13-base pair helix. Although such T-T interactions would not be present in solution, they illustrate a remarkable tendency of thymines for self-association. C.D.

A88-48324
A MATHEMATICAL MODEL FOR POSTIRRADIATION AUTOIMMUNITY [MATEMATICHESKAIA MODEL' POSTRADIATSIONNOGO AUTOIMMUNITETA]
O. A. SMIRNOVA (Institut Mediko-Biologicheskikh Problem, Moscow, USSR) Radiobiologiia (ISSN 0033-8192), vol. 28, May-June 1988, p. 331-335. In Russian. refs

A mathematical model of cellular autoimmune process in exposed mammals was developed. In terms of this model a study was made of the dependence of the autoimmunity kinetics on radiation dose and radiosensitivity of autologous tissues. The model

simulates the experimentally observed dynamics of autoimmune diseases. Author

A88-48325
A DOSIMETRIC CRITERION FOR THE INTESTINAL FORM OF ACUTE RADIATION SICKNESS IN HUMANS - THE LOSS OF BARRIER PROPERTIES OF THE SMALL INTESTINE AS AN INDICATOR OF THE SEVERITY OF RADIATION INJURY [DOZIMETRICHESKII KRITERII DLIA KISHECHNOI FORMY OSTROGO LUCHEVOGO PORAZHENIIA CHELOVEKA - POTERIA BAR'ERNYKH SVOISTV TONKOGO KISHECHNIKA - POKAZATEL' TIAZHESTI PORAZHENIIA]
V. L. GOZENBUK and I. B. KEIRIM-MARKUS (Institut Biofiziki, Moscow, USSR) Radiobiologiia (ISSN 0033-8192), vol. 28, May-June 1988, p. 335-339. In Russian. refs

A88-48326
OVERALL BIOLOGICAL ACTIVITY OF THE SENSORIMOTOR AND VISUAL BRAIN CORTEX OF RABBITS WITH EARLY NEUROLOGICAL DISORDERS INDUCED BY HIGH DOSES OF GAMMA-RADIATION [SUMMARNAIA BIOELEKTRICHESKAIA AKTIVNOST' SENSOMOTORNOI I ZRITEL'NOI KORY GOLOVNOGO MOZGA KROLIKOV V PERIOD RANNIKH NEVROLOGICHESKIKH NARUSHENII PRI GAMMA-OBLUCHENII V BOL'SHIKH DOZAKH]
D. IA. SILIN (Institut Biofiziki, Moscow, USSR) Radiobiologiia (ISSN 0033-8192), vol. 28, May-June 1988, p. 350-355. In Russian. refs

The overall bioelectrical activity of the sensorimotor and visual brain cortex of rabbits was estimated during early neurological impairment caused by 120 Gy gamma-irradiation. The characteristic changes were revealed in the amplitude, form, energy spectrum and spatial biopotential synchronization. The changes in the bioelectrical activity of the brain were associated with the clinically displayed stages of the neurological process development. Author

A88-48328
THE INFLUENCE OF ADETURON ON THE POSTIRRADIATION MACROMOLECULAR SYNTHESIS IN PERIPHERAL BLOOD LEUCOCYTES OF GAMMA-IRRADIATED RATS [VLIIANIE ADETURONA NA POSTRADIATSIONNYI SINTEZ MAKROMOLEKUL V LEIKOTSITAKH PERIFERICHESKOI KROVI OBLUCHENNYKH GAMMA-LUCHAMI KRYS]
TS. MARINOVA and T. PANTEV (Meditsinska Akademiia, Institut Rentgenologii i Radiobiologii, Sofia, Bulgaria) Radiobiologiia (ISSN 0033-8192), vol. 28, May-June 1988, p. 390-392. In Russian. refs

DNA, RNA, and protein syntheses were studied in peripheral blood leucocytes of irradiated (1-7 Gy) rats. Adeturon was shown to produce a pronounced protective effect on DNA synthesis progressively inhibited by the doses applied. The protective effect of the agent was not manifest with the slightly increased synthesis of RNA. There was a trend toward normalization of the increased protein synthesis. Author

A88-48329
EFFECT OF ALPHA-TOCOPHEROL ON ELECTRIC TRANSFER CHAIN ENZYMES OF IRRADIATED RAT LIVER MICROSOMES [DEISTVIE GAMMA-TOKOFEROLA NA FERMENTY ELEKTRON-TRANSPORTNYKH TSEPEI MIKROSOM PECHENI OBLUCHENNYKH KRYS]
M. I. BUSHMA (AN BSSR, Institut Biokhimii, Grodno, Belorussian SSR) Radiobiologiia (ISSN 0033-8192), vol. 28, May-June 1988, p. 426-429. In Russian. refs

Five days following single whole-body gamma-irradiation of rats (8.5 Gy), the rate of NADPH and NADH oxidation, the activity of NADPH-cytochrome P-450 and NADH-cytochrome b5 reductases, and the content of cytochromes P-450 and b5 were found to decrease. The intragastric administration of alpha-tocopherol (100 mg/kg, two times a day) produced a normalizing effect. Author

N88-26015*# California Univ., San Diego, La Jolla. Dept. of Chemistry.
THE EVOLUTION OF GLUTATHIONE METABOLISM IN PHOTOTROPHIC MICROORGANISMS
ROBERT C. FAHEY, RALPH M. BUSCHBACHER, and GERALD L. NEWTON 1988 29 p Submitted for publication
(Contract NAGW-342)
(NASA-CR-182902; NAS 1.26:182902) Avail: NTIS HC A03/MF A01 CSCL 06B

The low molecular weight thiol composition of a variety of phototropic microorganisms is examined in order to ascertain how evolution of glutathione (GSH) production is related to the evolution of oxygenic photosynthesis. Cells were extracted in the presence of monobromobimane (mBBr) to convert thiols (RSH) to fluorescent derivatives (RSmB) which were analyzed by high performance liquid chromatography (HPLC). Significant levels of GSH were not found in green sulfur bacteria. Substantial levels were present in purple bacteria, cyanobacteria, and eukaryotic algae. Other thiols measured included cysteine, gamma-glutamylcysteine, thiosulfate, coenzyme A, and sulfide. Many of the organisms also exhibited a marked ability to reduce mBBr to syn-(methyl,methyl)bimane, an ability which was quenched by treatment with 2-pyridyl disulfide or 5,5 prime-bisdithio - (2-nitrobenzoic acid) prior to reaction with mBBr. These observations indicate the presence of a reducing system capable of electron transfer to mBBr and reduction of reactive disulfides. The distribution of GSH in phototropic eubacteria indicates that GSH synthesis evolved at or around the time that oxygenic photosynthesis evolved. Author

N88-26016# European Space Agency, Paris (France).
PROCEEDINGS OF THE COLLOQUIUM ON SPACE AND SEA
T. D. GUYENNE, ed. and J. J. HUNT, ed. Mar. 1988 339 p Partly in ENGLISH and FRENCH Colloquium held in Marseille, France, 24-27 Nov. 1987; sponsored by AAAF, Association Technique Maritime et Aeronautique, and Societe des Amis de l'ENSAE et de l'ENSTA
(ESA-SP-280; ISSN-0379-6566; ETN-88-92782) Avail: NTIS HC A15/MF A01

Living in a confined environment; living and workplaces in space and underwater; space and underwater robots; and the contribution of space to marine activities were discussed. ESA

N88-26022*# Institut Francais de Speleologie, Nice. Lab. Souterrain de Chronobiologie.
BIOLOGICAL RHYTHMS, SLEEP, AND WAKEFULNESS IN PROLONGED CONFINEMENT [RYTHMES BIOLOGIQUES, SOMMEIL ET VIGILANCE EN CONFINEMENT PROLONGE]
MICHAEL SIFFRE *In* ESA, Proceedings of the Colloquium on Space and Sea p 53-68 Mar. 1988 In FRENCH; ENGLISH summary Sponsored in cooperation with the Ministere des Armees, France, and the Ministere de l'Interieur, France
(Contract NSG-517)
Avail: NTIS HC A15/MF A01

The dysynchronization of human circadian rhythms during 7 long-term (2 to 6 months) confinement experiments in temporal isolation in caves was studied. Five subjects abandon the circadian period of sleep and wakefulness (S-W) and spontaneously reach a circabidian S-W cycle (34 to 36 hr waking, 14 to 12 hr sleep) they maintain during weeks. Some subjects reach the 48 hr cycle very quickly (8 to 15 days), others after months. Polygraphic analyses of sleep show that rapid eye movement state (REMS) duration is directly proportional to the total duration of sleep and that the ultradian periodicity of REMS remains constant when S-W cycle is circadian or circabidian. When S-W cycle desynchronizes from circadian to circabidian, REMS and S-4 increase at the expense of stages I-2 and remain in constant relationship with the duration of previous wakefulness period. ESA

N88-26025*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
THE RELATIONSHIP BETWEEN PREFLIGHT UNDERWATER TRAINING AND SPACE MOTION SICKNESS

E. M. YOUMANS and K. L. KREUTZBERG *In* ESA, Proceedings of the Colloquium on Space and Sea p 83-85 Mar. 1988
Avail: NTIS HC A15/MF A01

Space Motion Sickness (SMS) severity was compared to WETF-(Weightless Environment Training Facility) trained and nontrained astronauts. Based on postflight medical debriefings, SMS severity was categorized as none, mild, moderate, and severe. The results show 63% of all crewmembers on their first shuttle flight experience SMS. Of those, 55% have symptoms ranked moderate to severe. From the nontrained group, 35% have no SMS, 18% mild, 29% moderate, and 18% severe. From the trained group, 41% have no SMS, 41% mild, 15% moderate, and 3% severe SMS. The results indicate an inverse relationship (p less than 0.01) between WETF training and SMS severity. Preflight WETF training may have operational significance as a viable countermeasure to SMS. ESA

N88-26067# Wisconsin Univ., Madison.
PHOTOCHROME FROM GREEN PLANTS: ASSAY, PURIFICATION AND CHARACTERIZATION
P. H. QUAIL 1 Mar. 1988 18 p
(Contract DE-AC02-81ER-10903)
(DE88-007511; DOE/ER-10903/8) Avail: NTIS HC A03/MF A01

This research has been directed toward characterizing and purifying the molecular species of phytochrome detected in green Avena tissue. We have found major differences between the phytochrome extracted from green and from etiolated tissue as regards immunochemial and spectral properties. In addition, we have established: (a) that the predominant phytochrome polypeptide in green tissue has a relative molecular mass (Mr) of 118,000;(b) that the proteolytic peptide map of this 118,000-Mr species differs considerably from that of 124,000-Mr phytochrome from etiolated tissue;(c) that the green-tissue, 118,000-Mr polypeptide carries only one of three spatially separate epitopes that are present on etiolated-tissue phytochrome; (d) that the minor phytochrome species in green tissue resembles that in etiolated tissue in that it is 124,000-Mr and is immunoprecipitable with polyclonal, anti-etiolated-oat-phytochrome antibodies, thereby accounting for the previously observed limited population of immunoprecipitable activity in green extracts; and (e) that the 118,000-Mr green-tissue molecule migrates on non-denaturing size exclusionchromatography as a approximately 320 kDa entity, suggesting a quaternary structure similar to etiolated tissue 124,000-Mr phytochrome. DOE

N88-26068# Tokyo Univ. (Japan). Inst. of Space and Astronautical Science.
EMBRYONIC DEVELOPMENT OF THE NEWT CYNOPS PYRRHOGASTER IN VERY WEAK MAGNETIC FIELDS
MAKOTO ASASHIMA, YOSHIHIRO MOGAMI, MAKOTO OKUNO, and SHOJI A. BABA Jan. 1987 16 p
(ISAS-RN-357) Avail: NTIS HC A03/MF A01

Whether embryogenesis of the newt, Cynops pyrrhogaster is affected by very weak magnetic fields was studied, using a large magnetic shielded room designed for the purpose of evaluation of magnetic characteristics of spacecraft and for other work in the Institute of Space and Astronautical Science. Newt adults, injected with gonadotropins a few days before and therefore ready to deliver eggs, fertilized eggs, and embryos of various developmental stages were left at 5-7 nT in the magnetic shielded room for up to several days. Embryos of most stages developed normally until at least 15 days later as did those of control experiments in the earth magnetic fields around the shielded room. As compared with control embryos, however, a higher percentage of embryos from eggs produced by the adults in the shielded room and of embryos placed there at stages from gastrula through neurula had delayed or arrested development and died within a few days. This fact suggests that embryos of very early stages including ovulation and fertilization and of the gastrula-neurula stage are sensitive to exposure to very weak magnetic fields. Author

N88-26069# Joint Publications Research Service, Arlington, Va.
JPRS REPORT: SCIENCE AND TECHNOLOGY. USSR: SPACE BIOLOGY AND AEROSPACE MEDICINE, VOLUME 22, NO. 1, JANUARY - FEBRUARY 1988
O. G. GAZENKO, ed. 23 Jun. 1988 153 p Transl. into ENGLISH of Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 22, no. 1, Jan. - Feb. 1988 96 p
(JPRS-USB-88-005) Avail: NTIS HC A08/MF A01

Articles are translated and presented from a Russian bimonthly journal entitled Space Biology and Aerospace Medicine. Representative titles from this journal are: Human hemodynamics during water immersion as related to position; Analysis of clinical symptoms of human decompression sickness; Growth and differentiation of cells in organotypical rat embryo cerebellar culture developing in weightlessness; Macaca Rhesus tolerance to +Gz accelerations; Effect of long term inhalation of acetic acid vapor on some functional parameters of man; Cardiac rhythm of animals consuming reclaimed water differing in concentration of sodium and potassium; and Biological patterns of growth in postnatal ontogenesis of lower primates.

N88-26076# Joint Publications Research Service, Arlington, Va.
GROWTH AND DIFFERENTIATION OF CELLS IN ORGANOTYPICAL RAT EMBRYO CEREBELLAR CULTURE DEVELOPING IN WEIGHTLESSNESS
I. V. VIKTOROV, N. A. SHASHKOVA, A. PRIVAT, and M.-J. DRIAN *In its* JPRS Report: Science and Technology. USSR: Space Biology and Aerospace Medicine, v. 22, no. 1, Jan.-Feb. 1988 p 29-34 23 Jun. 1988 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina, Moscow (USSR), v. 22, no. 1, Jan.-Feb. 1988 p 25-29
Avail: NTIS HC A08/MF A01

Cerebellar cells of 18 day rat fetuses that developed for 5 days on Cosmos 1514 and those of synchronous and vivarium controls were cultivated for 21 days in Maximov chambers. Light microscopic examinations of live explants and semithin sections revealed no disorders in histotypical structures of cells. It is concluded that space flight effects on the cerebellar morphogenesis of rat fetuses exposed to microgravity during days 13 to 18 of their prenatal development did not lead to such changes in the differentiation of nerve and glia cells which would cause morphogenetic disorders during postflight organotypical cultivation. Author

N88-26078# Joint Publications Research Service, Arlington, Va.
EFFECT OF DIFFERENT DOSES OF ALPHA-HYDROXYDIMETHYL-GAMMA-AMINOPROPYLIDENE BISPHOSPHONATE ON RAT BONES
V. N. SHVETS *In its* JPRS Report: Science and Technology. USSR: Space Biology and Aerospace Medicine, v. 22, no. 1, Jan.-Feb. 1988 p 41-45 23 Jun. 1988 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina, Moscow (USSR), v. 22, no. 1, Jan.-Feb. 1988 p 34-37
Avail: NTIS HC A08/MF A01

For 10 days rats were subcutaneously injected with alpha-hydroxydimethyl gamma aminopropylidene biphosphonate in the dose range 0.005 to 5 mg/kg/day. As shown morphometrically, the mass of spongy bone increased linearly with the dose. It was found that the drug affected primarily the highly metabolic component of spongy bone. The drug has a systemic osteotropic effect and modified the number of osteocytes significantly. When the drug was injected for a long time (up to 60 days), the number of osteoclasts decreased and the proportion of cells containing more than one nucleus remained within normal limits. The number of osteoblasts either diminished (in long bones) or remained unchanged (in torso and pelvic bones). It is concluded that the osteotrophic effect of the drug is mediated via its action on bone resorption, the rate of which is inhibited; this is responsible for bone mass growth. Author

N88-26079# Joint Publications Research Service, Arlington, Va.
ROLE OF OPIOID PEPTIDES IN PATHOGENESIS OF VESTIBULOVEGETATIVE DISORDERS

V. S. SHASHKOV, YU. V. DROZD, V. V. YASNETSOV, YE. YU. GALKINA, and YU. I. RYUMIN *In its* JPRS Report: Science and Technology. USSR: Space Biology and Aerospace Medicine, v. 22, no. 1, Jan.-Feb. 1988 p 46-50 23 Jun. 1988 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina, Moscow (USSR), v. 22, no. 1, Jan.-Feb. 1988 p 37-40
Avail: NTIS HC A08/MF A01

A study was carried out using 12 noninbred male cats and 14 white rats. In response to vestibuloautonomic disorders, the rats showed a decrease of beta-endorphin in the midbrain, medulla oblongata and hypothalmus as well as a reduction of met-enkephaline in the hypothalamus and medulla oblongata. The concentration of met-enkaphaline in the adrenals increased and that of beta-endorphine in blood did not change. This may be attributed to the intraneuronal redistribution of opioids and their transfer to the pituitary or release in the cerebrospinal fluid. Opioid variations give evidence that vestibuloautonomic disorders in rats do not stimulate the pituitary adrenal system. The cats were exposed to vestibulo-autonomic disorders and subsequent intracerebroventricular administration of regulatory peptides or injection of opiate receptor blockers into the chemoreceptor trigger zone. It was demonstrated that naloxone, gamma endorphine and des-Tyr-gamma-endorphine were effective in protecting the vestibular function whereas ICI 154, 129 (a selective antagonist of delta receptors) was practically ineffective. Author

N88-26080# Joint Publications Research Service, Arlington, Va.
MACACA RHESUS TOLERANCE TO +GZ ACCELERATIONS
I. F. VIL-VILYAMS, V. I. KOROLKOV, V. P. KROTOV, A. A. SHIPOV, V. G. ANDREYEVA, L. A. TABAKOVA, S. F. KHOLIN, A. N. TRUZHENNIKOV, and YU. V. GORDEYEV *In its* JPRS Report: Science and Technology. USSR: Space Biology and Aerospace Medicine, v. 22, no. 1, Jan.-Feb. 1988 p 51-57 23 Jun. 1988 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina, Moscow (USSR), v. 22, no. 1, Jan.-Feb. 1988 p 40-45
Avail: NTIS HC A08/MF A01

The procedure of selection and training of rhesus monkeys included +Gz acceleration tests. Two experimental series were performed. In the first experimental series (52 monkeys) acceleration tolerance was determined with respect to general health condition and behavioral responses of animals, electrocardiographic data (in 3 standard leads), heart rate and respiration rate. In the second experimental series, acceleration tolerance was measured on the basis of blood pressure and flow velocity in the common carotid artery. Rhesus monkeys exhibited noticeable individual variations in +Gz tolerance as well as in circulation responses to this exposure. The tests helped to select flight animals with a high level of acceleration tolerance. Author

N88-26083# Joint Publications Research Service, Arlington, Va.
HEMORRHAGES AND HEMOSTASIS IN GUINEA PIGS EXPOSED TO RADIATION AT HIGH ALTITUDE
V. N. TARTAKOVSKIY and S. B. DANIYAROV *In its* JPRS Report: Science and Technology. USSR: Space Biology and Aerospace Medicine, v. 22, no. 1, Jan.-Feb. 1988 p 70-76 23 Jun. 1988 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina, Moscow (USSR), v. 22, no. 1, Jan.-Feb. 1988 p 53-57
Avail: NTIS HC A08/MF A01

Hemorrhagic intensity, hemostasis and blood vessel wall resistance to mechanical effects were studied in guinea pigs exposed to whole body irradiation (3.0 Gy). The animals were irradiated at low altitude (760 m above sea level) and at high altitude (3200 m above sea level) after 1 and 31 days of adaptation. It was demonstrated that hemorrhagic intensity in both groups of guinea pigs irradiated at high altitude was significantly reduced in comparison with that in low altitude. The decrease in radiation induced hemorrhages at high altitude is associated with less severe changes in thrombopoiesis, blood vessel wall and blood coagulation. Author

N88-26085# Joint Publications Research Service, Arlington, Va.
CARDIAC RHYTHM OF ANIMALS CONSUMING RECLAIMED WATER DIFFERING IN CONCENTRATION OF SODIUM AND POTASSIUM IONS
V. A. KONDRATYUK and M. S. GNATYUK *In its* JPRS Report: Science and Technology. USSR: Space Biology and Aerospace Medicine, v. 22, no. 1, Jan.-Feb. 1988 p 83-86 23 Jun. 1988 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina, Moscow (USSR), v. 22, no. 1, Jan.-Feb. 1988 p 61-63
Avail: NTIS HC A08/MF A01

The effect of reclaimed potable water on cardiac rhythms of 190 noninbred white male rats was investigated in a 6 month experiment. The water contained 25.0 to 100.0 mg/l sodium and/or 2.5 to 10.0 mg/l potassium. The water containing 100 mg/l sodium and 10 mg/l potassium caused changes in both compartments of the autonomic nervous system controlling cardiac rhythms. The water containing 75.0 and 50.0 mg/l sodium and 7.5 and 5.0 mg/l potassium produced insignificant changes in cardiac rhythms. The water containing lower concentrations of sodium (25.0 mg/l) and potassium (2.5 mg/l) had no effect. Author

N88-26086# Joint Publications Research Service, Arlington, Va.
VALIDATION OF MAXIMUM PERMISSIBLE CONCENTRATION OF UREA IN RECLAIMED POTABLE WATER AND EVALUATION OF ITS BIOLOGICAL EFFECT
N. V. MIRONETS, R. V. SAVINA, I. S. KUCHEROV, V. V. SOLNTSEVA, and N. V. MARTYSHCHENKO *In its* JPRS Report: Science and Technology. USSR: Space Biology and Aerospace Medicine, v. 22, no. 1, Jan.-Feb. 1988 p 87-91 23 Jun. 1988 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina, Moscow (USSR), v. 22, no. 1, Jan.-Feb. 1988 p 63-66
Avail: NTIS HC A08/MF A01

The study was used to identify maximum allowable concentrations of urea in reclaimed potable water. The urea concentration equal to 80 mg/l is the threshold dose influencing the taste and flavor of water. Urea is a low toxicity substance, the effect of which is not cumulative. However, when used in high doses it affects bioenergetic and cholinergi processes and causes changes in ECG, higher nervous activity and visceral structure. It was shown that when applied to warm blooded animals, the acting dose of urea is 14.3 and 1.43 mg/kg, the threshold dose is 0.72 mg/kg, and the ineffective dose is 0.36 mg/kg which amounts to the concentration of 10 mg/l. In terms of toxic effects, the dose equal to 10 mg/l is taken to be the maximally allowable concentration of urea. It is recommended to use the Laham biotest for measuring urea in water. Author

N88-26087# Joint Publications Research Service, Arlington, Va.
BIOLOGICAL PATTERNS OF GROWTH IN POSTNATAL ONTOGENESIS OF LOWER PRIMATES
YU. N. KUROCHKIN and G. S. BELKANIYA *In its* JPRS Report: Science and Technology. USSR: Space Biology and Aerospace Medicine, v. 22, no. 1, Jan.-Feb. 1988 p 92-98 23 Jun. 1988 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina, Moscow (USSR), v. 22, no. 1, Jan.-Feb. 1988 p 66-70
Avail: NTIS HC A08/MF A01

In 840 male rhesus monkeys relationships between age, height, weight and growth rate were examined. In terms of growth rate, the following five age periods were identified in the predefinitive stage of postnatal ontogenesis: childhood - from birth to 9 months; adolescence - from 9 month to 3 years; accelerated growth or pubescence - from 3 to 4.5 years; growth completion - from 4.5 to 7 or 8 years; and physiological maturity (definitive stage) - over 8 years. The above age periods derived from growth curves are consistent with the development of the dental system, reproductive organs and other biological signs of postnatal ontogenesis. The relationships between calender age, height and weight with respect to each age period are described by linear regression equations. The basic patterns of physical development, period of postnatal ontogenesis and somatometric characterization described above

help to objectively monitor the physical fitness of rhesus monkeys, to adequately select animals identical in terms of their biological age, and to reliably plan long term studies on this primate species. Author

N88-26089# Joint Publications Research Service, Arlington, Va.
USE OF PRINCIPAL COMPONENT METHOD FOR ANALYSIS OF MULTIDIMENSIONAL QUANTITATIVE DATA IN BIOMEDICAL INVESTIGATIONS
S. L. CHEKANOVA, T. M. SMIRNOVA, and M. A. MATROSOVA *In its* JPRS Report: Science and Technology. USSR: Space Biology and Aerospace Medicine, v. 22, no. 1, Jan.-Feb. 1988 p 103-106 23 Jun. 1988 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina, Moscow (USSR), v. 22, no. 1, Jan.-Feb. 1988 p 73-75
Avail: NTIS HC A08/MF A01

The principal component method (PCM) is being used with success for analysis of multidimensional biomedical data of the quantitative type. It permits compression of information contained in the measured parameters and concentration of its main part in several numbers, values of the first principle component (PC) that explain a significant share of the scatter of the baseline. PCM is used to solve three important classes of problems in the area of biomedical investigations: formation of general evaluations (integral parameters) on the basis of a set of observed characters; classification of objects of observation in the space of generalized parameters; quantitative description of certain characteristics of objects as a function of values on integral ratings. PCM involves the use of orthogonal conversion of observed variables in order to obtain new, uncorrelated variables - PC having the following properties: scatter of point projections over the first PC is at a maximum, as compared to all other directions; the sum of the squares of distances from original points to their projections on the first PC is minimal. PCM is further discussed and illustrated. Author

N88-26096*# Lockheed Engineering and Management Services Co., Inc., Washington, D.C.
USSR SPACE LIFE SCIENCES DIGEST, ISSUE 18
LYDIA RAZRAN HOOKE, ed., P. LYNN DONALDSON, ed., RONALD TEETER, ed., VICTORIA GARSHNEK, ed., and JOSEPH ROWE, ed. (Library of Congress, Washington, D. C.) Washington NASA Jul. 1988 140 p
(Contract NASW-4292)
(NASA-CR-3922(21); NAS 1.26:3922(21)) Avail: NTIS HC A07/MF A01 CSCL 06B

This is the 18th issue of NASA's USSR Life Sciences Digest. It contains abstracts of 50 papers published in Russian language periodicals or presented at conferences and of 8 new Soviet monographs. Selected abstracts are illustrated with figures and tables from the original. A review of a recent Aviation Medicine Handbook is also included. The abstracts in this issue have been identified as relevant to 37 areas of space biology and medicine. These areas are: adaptation, aviation medicine, biological rhythms, biospherics, body fluids, cardiovascular and respiratory systems, cytology, developmental biology, endocrinology, enzymology, equipment and instrumentation, exobiology, gastrointestinal system, genetics, gravitational biology, group dynamics, habitability and environmental effects, hematology, human performance, immunology, life support systems, man-machine systems, mathematical modeling, metabolism, microbiology, musculoskeletal system, neurophysiology, nutrition, operational medicine, perception, personnel selection, psychology, radiobiology, reproductive biology, space biology and medicine, and space industrialization. Author

N88-26785# Joint Publications Research Service, Arlington, Va.
JPRS REPORT: SCIENCE AND TECHNOLOGY. USSR: LIFE SCIENCES
10 Jun. 1988 32 p Transl. into ENGLISH from various Russian articles
(JPRS-ULS-88-009) Avail: NTIS HC A03/MF A01

Translated abstracts and articles from various USSR books and journals are presented under the general heading of Life Sciences. Various subheadings are: Aerospace Medicine; Agricultural Science; Biochemistry; Biophysics; Immunology; Laser Bioeffects; Molecular Biology; Pharmacology, Toxicology; Physiology; and Public Health. Abstracts from Aerospace Medicine and Physiology are of particular interest to NASA.

N88-26786# Joint Publications Research Service, Arlington, Va.
EFFECT OF WEIGHTLESSNESS ON BRAIN DEVELOPMENT (RESULTS OF FLIGHT OF PREGNANT RATS ON KOSMOS-1514 BIOSATELLITE AND STUDY OF SUBSEQUENT DEVELOPMENT OF THEIR PROGENY ON EARTH Abstract Only
S. N. OLENEV, A. R. DANILOV, T. A. KRYUCHKOVA, L. M. SOROKINA, and I. B. KRASNOV *In its* JPRS Report: Science and Technology. USSR: Life Sciences p 1 10 Jun. 1988 Transl. into ENGLISH from Arkhiv Anatomii, Gistologii i Embriologii (Leningrad, USSR), v. 93, no. 9, Sep. 1987 p 20-27
Avail: NTIS HC A03/MF A01

Materials obtained from the biosatellite Kosmos-1514 were used to determine whether or not weightlessness causes changes in brain development in rats and, if so, what processes are responsible and what are the consequences of these changes during further development on earth. The rats were under conditions of weightlessness on the 13th day of pregnancy and were in flight for 6 days. Some fetal material was taken immediately after landing and some was taken on the 15th, 30th and 90th day of development, and this material was compared to fetal material of rats kept on earth. Morphological processes such as reproduction, migration, neuronal differentiation, growth of processes, establishment of nervous connection and vascularization developed rather completely during weightlessness and brief acceleration upon landing. The rat experiencing weightlessness showed a change in development of the cerebral capillaries; there were more of them and they were thinner. Changes in migration rate of cells were evident from study of the cortical plate formation. Macroscopic examination of fixed brain pieces showed no appreciable differences between the experimental rats and control rats. Author

N88-26790# Joint Publications Research Service, Arlington, Va.
RESPIRATION AND OXYGEN TENSION IN THE BLOOD OF ANIMALS EXPOSED TO HIGH PRESSURES Abstract Only
F. P. TULBAYEVA *In its* JPRS Report: Science and Technology. USSR: Life Sciences p 16-17 10 Jun. 1988 Transl. into ENGLISH from Izvestiya Akademii Nauk Kazakhskoy SSR, Seriya Biologicheskaya (Alma-Ata, USSR), no. 4, Jul. - Aug. 1987 p 74-77
Avail: NTIS HC A03/MF A01

A study is presented of the dynamics of the respiratory function and oxygen tension in arterial and venous blood in animals during time spent in a nitrogen-oxygen mixture under high pressure. The experiments were performed on 12 male rabbits exposed for two hrs to a normoxic nitrogen-oxygen mixture under a pressure of 40 kgf/sq cm. Respiration frequency and volume per minute decreased sharply during the course of 2 hrs exposure to high pressure. Oxygen tension in both arterial and venous blood gradually decreased over the same time. Survival time of the animals varied, but all died from asphyxia during the course of the experiment. It is suggested that the high density of the gas being breathed increased respiration resistance, causing a decrease in pulmonary ventilation and resultant oxygen deficiency. Author

N88-26791# Gas Research Inst., Chicago, Ill. Chemical Technology Div.
PHOTOSYNTHETIC WATER SPLITTING Annual Report, 1987
E. GREENBAUM Jan. 1988 36 p
(Contract DE-AC05-84OR-21400; GRI-5883-260-0880)
(DE88-007809; ORNL/TM-10704; GRI-88/0044) Avail: NTIS HC A03/MF A01

This document is an annual report of photosynthetic water splitting for the production of hydrogen and oxygen. Unicellular

green algae are capable of evolving molecular hydrogen in the presence of carbon dioxide. Controlling factors that determine hydrogen evolution are either temperature or light intensity. Also, mutants of the green alga Chlamydomonas are capable of evolving hydrogen in the presence of carbon dioxide. The significance of these discoveries is that the presence of carbon dioxide (or bicarbonate) is a key factor in determining the activity of the Photosystem 2 water splitting complex. Second, a new advance in oxygen sensor technology has been made that, for the first time, allows the absolute measurement of photosynthetically evolved oxygen from a single colony of microalgae growing on a solidified agar medium. The key aspect of this electrochemical sensor is the utilization of ultra-pure potassium hydroxide as the electrolyte and a recognition of the role that electrolyte impurities play in contributing to base line noise. DOE

N88-26792# Pacific Northwest Labs., Richland, Wash.
INTERACTION OF BIOLOGICAL SYSTEMS WITH STATIC AND ELF ELECTRIC AND MAGNETIC FIELDS
L. E. ANDERSON, ed., B. J. KELMAN, ed., and R. J. WEIGEL, ed. 1987 540 p Presented at the 23rd Hanford Life Sciences Symposium, Richland, Wash., 2 Oct. 1984
(Contract DE-AC06-76RL-01830)
(DE88-007951; CONF-841041) Avail: NTIS HC A23/MF A01

Although background levels of atmospheric electric and geomagnetic field levels are extremely low, over the past several decades, human beings and other life forms on this planet have been subjected to a dramatically changing electromagnetic milieu. An exponential increase in exposure to electromagnetic fields has occurred, largely because of such technological advances as the growth of electrical power generation and transmission systems, the increased use of wireless communications, and the use of radar. In addition, electromagnetic field generating devices have proliferated in industrial plants, office buildings, homes, public transportation systems, and elsewhere. Although significant increases have occurred in electromagnetic field strenghths spanning all frequency ranges, this symposium addresses only the impact of these fields at static and extremely low frequencies (ELF), primarily 50 and 60 Hz. This volume contains the proceedings of the symposium entitled Interaction of biological systems with static and ELF electric and magnetic fields . The purpose of the symposium was to provide a forum for discussions of all aspects of research on the interaction of static and ELF electromagnetic fields with biological systems. These systems include simple biophysical models, cell and organ preparations, whole animals, and man. Dosimetry, exposure system design, and artifacts in ELF bioeffects research were also addressed, along with current investigations that examine fundamental mechanisms of interactions between the fields and biological processes. Papers are indexed separately. DOE

N88-26793# Argonne National Lab., Ill.
MODELING THE PRIMARY EVENTS OF PHOTOSYNTHESIS USING CHLOROPHYLL CONTAINING FIXED DISTANCE DONOR-ACCEPTOR MOLECULES
M. R. WASIELEWSKI, D. G. JOHNSON, and W. A. SVEC 1988 4 p Presented at the US-Japan Information Exchange Seminar, Kyoto, Japan, 8 Jan. 1988
(Contract W-31-109-ENG-38)
(DE88-010033; CONF-880181-1) Avail: NTIS HC A02/MF A01

Two specific questions that we addressed are: how does the dimeric primary electron donor in photosynthetic proteins initiate charge separation, and how do electron transfer reactions from chlorophylls to quinones depend on free energy of reaction and the surrounding medium. DOE

N88-26794# Yale Univ., New Haven, Conn. Dept. of Ophthalmology and Visual Science.
REGULATORY BIOCHEMICAL AND METABOLIC RESPONSES IN PHOTORECEPTORS Final Report, 1 Jul. 1984 - 30 Sep. 1987
PETER J. STEIN Nov. 1987 41 p
(Contract AF AFOSR-0171-84)
(AD-A192898; AFOSR-88-0567TR) Avail: NTIS HC A03/MF A01 CSCL 06A

Studies of near infrared light scattering changes in disk membrane suspensions reveal three novel phenomena. The light induced scattering changes observed in the presence of Guanosine triphosphate and Cyclic guanosine monophosphate were produced by aggregation/disaggregation of the membrane vesicles. This aggregation/disaggregation process was correlated with activation of phosphodiesterase and a change in its apparent solubility. That is, PDE became more tightly bound to the membrane when it was activated. We have begun preliminary studies of near infrared scattering signals in the isolated retina. In this preliminary work, we have observed that IBMX, an inhibitor of phosphodiesterase activity, profoundly affects the infrared light scattering signal in the isolated retina. It seems likely that the in vitro and in vivo signals may share a common origin. In a separate series of experiments, we have purified opsin, the apoprotein of the visual pigment protein, and reconstituted it into phospholipid vesicles. We used patch clamp recording to demonstrate that the purified, reconstituted protein exhibits cGMP-activated single channel activity. These results suggest that opsin, in addition to performing its function as the receptor molecule, may be the light-sensitive pore in the plasma membrane of the rod outer segment. GRA

N88-26795*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
VEGETATION STUDIES ON VANDENBERG AIR FORCE BASE, CALIFORNIA
PAUL A. SCHMALZER, DIANA E. HICKSON, and C. ROSS HINKLE (Bionetics Corp., Cocoa Beach, Fla.) Mar. 1988 484 p
(Contract NAS10-10285)
(NASA-TM-100985; NAS 1.15:100985) Avail: NTIS HC A21/MF A01 CSCL 06B

Vandenburg Air Force Base, located in coastal central California with an area of 98,400 ac, contains resources of considerable biological significance. Available information on the vegetation and flora of Vandenburg is summarized and new data collected in this project are presented. A bibliography of 621 references dealing with vegetation and related topics related to Vanderburg was compiled from computer and manual literature searches and a review of past studies of the base. A preliminary floristic list of 642 taxa representing 311 genera and 80 families was compiled from past studies and plants identified in the vegetation sampling conducted in this project. Fifty-two special interest plant species are known to occur or were suggested to occur. Vegetation was sampled using permanent plots and transects in all major plant communities including chaparral, Bishop pine forest, tanbark oak forest, annual grassland, oak woodland, coastal sage scrub, purple sage scrub, coastal dune scrub, coastal dunes, box elder riparian woodland, will riparian woodland, freshwater marsh, salt marsh, and seasonal wetlands. Comparison of the new vegetation data to the compostie San Diego State University data does not indicate major changes in most communities since the original study. Recommendations are made for additional studies needed to maintain and extend the environmental data base and for management actions to improve resource protection. Author

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AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and effects of weightlessness on man and animals.

A88-46201
HIGH G AND HIGH G PROTECTION - AEROMEDICAL AND OPERATIONAL ASPECTS; PROCEEDINGS OF THE SYMPOSIUM, LONDON, ENGLAND, OCT. 21, 1987

London, Royal Aeronautical Society, 1987, 91 p. For individual items see A88-46202 to A88-46212.

The present conference on the aeromedical and operational aspects of aircrew high-G protection discusses the physiology of +G(z) acceleration and the limits of its tolerance, RAF experience with G-induced loss of consciousness (G-LOC), the design and manufacture of anti-G trousers, and anti-G valves for future combat aircraft. Also discussed are G-sensitive breathing regulators, G-LOC detection and autorecovery, methods for G-tolerance enhancement, RAF flight trials of positive pressure breathing, centrifuge training and selection of aircrews for high-G tolerance, and design considerations for G-LOC avoidance. O.C.

A88-46203
PHYSIOLOGY OF +G(Z) ACCELERATION AND TOLERANCE LIMITS

D. H. GLAISTER (RAF, Institute of Aviation Medicine, Farnborough, England) IN: High G and high G protection - Aeromedical and operational aspects; Proceedings of the Symposium, London, England, Oct. 21, 1987. London, Royal Aeronautical Society, 1987, p. 9-15.

The present evaluation of current understanding of physiological effects on aircrews due to downward, positive-gravity, or +G(z) loading, notes that with a rapid rate of onset of such acceleration, at 1.0-G/sec or more, loss of peripheral vision occurs at +3-4G(z), blackout at +4-5G(z), and loss of consciousness at +5-6G(z). There is, however, a wide individual variation among pilots in +G(z) resistance due to blood pressure and height differences, as well as relaxation (muscle tone) effects. A slower rate of +G(z) onset, of the order of 0.1-G/sec, allows a pilot's baroreceptor response to develop and tolerance levels are accordingly increased by about 1G. O.C.

A88-46204
RAF EXPERIENCE OF G INDUCED LOSS OF CONSCIOUSNESS

A. R. J. PRIOR (RAF, Institute of Aviation Medicine, Farnborough, England) IN: High G and high G protection - Aeromedical and operational aspects; Proceedings of the Symposium, London, England, Oct. 21, 1987. London, Royal Aeronautical Society, 1987, p. 16-25. refs

An analysis is made of results obtained from an RAF survey aimed at assessing the extent of current acquaintance of crewmembers with the incidence of G-induced loss of consciousness, or 'G-LOC'. The survey obtained 2753 responses from crews of all types of aircraft. The Jet Provost training aircraft, which is not equipped with anti-G devices, dominated the survey results. Attention is given to results obtained for G rates-of-onset, recovery times experienced after a G-LOC event, the symptoms experienced during recovery, and the apparent causes of G-LOC. O.C.

A88-46208
G-LOC DETECTION AND AUTORECOVERY

D. H. GLAISTER (RAF, Institute of Aviation Medicine, Farnborough, England) IN: High G and high G protection - Aeromedical and operational aspects; Proceedings of the Symposium, London, England, Oct. 21, 1987. London, Royal Aeronautical Society, 1987, p. 48-55.

Near-IR multiwavelength spectrophotometry (NIMS) is presently noted to be a promising approach to the measurement of intracerebral mechanisms bearing directly on the brain's oxygen sufficiency during high +G(z) loading at the cellular level, as required during the onset of G-induced loss of consciousness. NIMS accomplishes such detection because both hemoglobin and oxyhemoglobin are chromophores, with distinctive absorption spectra in the near-IR; in this wavelength range, body tissues are highly transparent. The sum of the two signals can be used to monitor brain blood volume. O.C.

A88-46209
METHODS FOR ENHANCING G TOLERANCE

A. R. J. PRIOR (RAF, Institute of Aviation Medicine, Farnborough, England) IN: High G and high G protection - Aeromedical and operational aspects; Proceedings of the Symposium, London, England, Oct. 21, 1987. London, Royal Aeronautical Society, 1987, p. 56-61. refs

An evaluation is made of current methods of G tolerance-enhancement and of their limitations, together with prospective developments that may allow aircrews to routinely tolerate accelerations of 12 G(z) or more. In all cases, the basis of anti-G methods' effectiveness is the limitation of the fall of arterial pressure at head level that ultimately results in loss of vision and of consciousness. In addition to anti-G pneumatic suits, muscle tensing-based, breathing-based, and posture-based G-counteraction methods are available to crews. Attention is given to advanced positive pressure breathing and seat reclination methods currently under development. O.C.

A88-46210
ROYAL AIR FORCE FLIGHT TRIALS OF POSITIVE PRESSURE BREATHING

R. M. HARDING and G. J. CRESSWELL (RAF, Institute of Aviation Medicine, Farnborough, England) IN: High G and high G protection - Aeromedical and operational aspects; Proceedings of the Symposium, London, England, Oct. 21, 1987. London, Royal Aeronautical Society, 1987, p. 62-71. refs

The use of positive-pressure breathing for G-force counteraction, or 'PBG', in high performance aircraft crew support systems has been found to result not only im an overall increase in tolerance to +G(z) acceleration, but also in a reduction of the fatigue associated with repeated exposure to such accelerations. This appears to be due to PBG's effect on both the cardiovascular and respiratory systems. Recent evidence from centrifuge studies has suggested that PBG in association with thoracic (chest) counterpressure is even more effective than PBG alone in reducing fatigue at high levels of sustained +G(z) acceleration. O.C.

A88-46211
CENTRIFUGE TRAINING AND SELECTION OF AIRCREW FOR HIGH-G TOLERANCE

D. H. GLAISTER (RAF, Institute of Aviation Medicine, Farnborough, England) IN: High G and high G protection - Aeromedical and operational aspects; Proceedings of the Symposium, London, England, Oct. 21, 1987. London, Royal Aeronautical Society, 1987, p. 72-77. refs

In 1977, the USAF School of Aerospace Medicine adopted a 15-sec, 1 G/sec loading to +7G(z) as a G-tolerance standard for the aeromedical evaluation of prospective aircrew members suspected of low G tolerance. Using this standard as a crew-selection criterion leads to passing by only 80 percent of male subjects. Experienced crews, however, have a virtually 100 percent pass rate at this level. Attention is presently given to two basic G-profiles used in an evaluation/training procedure, together with a third, simulated air combat mission profile that is especially valuable for the assessment of physical fitness. O.C.

A88-46262
HUMAN FACTORS OF HELICOPTER VIBRATION. I - THE PHYSIOLOGICAL EFFECTS OF VIBRATION

G. R. BARNES (RAF, Institute of Aviation Medicine, Farnborough, England) IN: Helicopter vibration and its reduction; Proceedings of the Symposium, London, England, Nov. 16, 1987. London, Royal Aeronautical Society, 1987, p. 20-30. refs

The primary adverse effect of helicopter vibration on crew physiology is the induced movement of the head and shoulder girdle. Due to their differing viscoelastic properties, these respond to different frequency components of the vibration; in addition, they are underdamped and therefore perform exaggerated movements at their resonant frequencies. Visual performance is especially affected by vibration, because the head movements induced may result in considerable relative motion between eyes and visual displays. O.C.

A88-46574#
THE RELATIONSHIP BETWEEN +GZ TOLERANCE AND MAXIMAL ANAEROBIC POWER
CHIEKO MIZUMOTO and MITSUKO KAMIKURA Japan Air Self Defence Force, Aeromedical Laboratory, Reports (ISSN 0023-2858), vol. 28, Sept. 1987, p. 79-83. In Japanese, with abstract in English. refs

The relationship between +Gz tolerance and maximal anaerobic power was tested in eight healthy men repeatedly exposed to 6 Gz for 15 sec and 3 Gz for 30 sec. The onset and offset rates were 1.0 Gz/sec, and the repetition of 6 Gz exposure was limited to six times. +Gz tolerance was determined by the G level at which the subjects felt a grayout. MAnP was measured by bicycle ergometer. A high-tolerance group (HTG) showed greater MAnP than a low-tolerance group. Higher +Gz tolerance may be related to heavier mean body weight of the HTG. The HTG showed significantly higher blood pressure elevation during the bicycle exercise. Individual +Gz tolerance appears to be determined by cardiovascular responsiveness to maximal exercise. C.D.

A88-47320
THERMOREGULATORY RESPONSES OF MIDDLE-AGED AND YOUNG MEN DURING DRY-HEAT ACCLIMATION
KENT B. PANDOLF, BRUCE S. CADARETTE, MICHAEL N. SAWKA, ANDREW J. YOUNG, RALPH P. FRANCESCONI (U.S. Army, Research Institute of Environmental Medicine, Natick, MA) et al. Journal of Applied Physiology (ISSN 0161-7567), vol. 65, July 1988, p. 65-71. refs

The effect of age on the thermoregulatory systems of humans during dry-heat acclimation was investigated by comparing thermoregulatory responses in young (mean age 21.2 y) and middle-aged (mean age 46.5 y) men who were matched for body weight, surface area, surface area-to-weight ratio, percent body fat, and maximal aerobic power. Heat acclimation was achieved by treadmill walking for two 50-min exercise bouts, separated by 10 min of rest, for 10 consecutive days in a hot (49 C, 20-percent relative humidity) environment. During the first few days of exercise-heat exposure, the thermoregulatory responses of middle-aged men were more adequate than those of young men: the performance time was longer, the final total body sweat loss was higher, and the final rectal and skin temperatures and the heart rate were lower. After acclimation, these differences disappeared, although final rated perceived exertion was generally higher for the young men throughout the acclimation period and final thermal sensation was higher on the first acclimation day. The results indicate that the hypothesis that aging per se impairs the thermoregulatory system through the fifth decade of life should be reconsidered. I.S.

A88-47323
SHIFT IN BODY FLUID COMPARTMENTS AFTER DEHYDRATION IN HUMANS
HIROSHI NOSE, GARY W. MACK, XIANGRONG SHI, and ETHAN R. NADEL (John B. Pierce Foundation; Yale University, New Haven, CT) Journal of Applied Physiology (ISSN 0161-7567), vol. 65, July 1988, p. 318-324. refs
(Contract NIH-HL-20634)

The effect of Na(+) concentration on the water mobilization from the intracellular fluid (ICF) space during thermal stress was investigated in human subjects who exercised to 40-percent maximal aerobic power in dry heat (36 C, less than 30-percent relative humidity) for 90-110 min to produce a dehydration of 2.3-percent body weight. The changes in the body fluid compartments were assessed after the subjects rested for 1 h at 28 C. It was found that the decrease in the ICF space was correlated with an increase in plasma osmolality, which was a function of the loss of free water. Free water loss showed a strongly inverse correlation with Na(+) in sweat. Fluid movement out of the ICF space attenuated the decrease in the extracellular fluid (ECF) space. A linear relationship was found between the changes in ECF and plasma volume. The results suggest that the maintenance of circulating blood volume during dehydration induced by exercise in heat is a function of the body's ability to mobilize fluid from the ICF space, which itself is linked to the Na(+) concentration in sweat. I.S.

A88-47324
ROLE OF OSMOLALITY AND PLASMA VOLUME DURING REHYDRATION IN HUMANS
HIROSHI NOSE, GARY W. MACK, XIANGRONG SHI, and ETHAN R. NADEL (John B. Pierce Foundation; Yale University, New Haven, CT) Journal of Applied Physiology (ISSN 0161-7567), vol. 65, July 1988, p. 325-331. refs
(Contract NIH-HL-20634)

The effect of sodium content in drinking water ingested during rehydration on the dipsogenic drive and on the restoration of the body fluid compartments after dehydration was investigated in human subjects during 4 h of recovery from 90-110 min exercise in dry heat, which caused a 2.3-percent body weight loss. Over the last 3 h of recovery, subjects rehydrated ad lib using tap water and capsules containing either placebo (H2O-R) or 0.45 g NaCl/100 ml water (Na-R). During the rehydration period, subjects in the H2O-R group were found to restore 68 percent of the lost water, whereas the Na-R subjects restored 82 percent. Urine volume was greater in H2O-R than in Na-R; thus, only 51 percent of the lost water was retained by the H2O-R group, whereas 71 percent was retained by Na-R subjects. In Na-R, plasma osmolality was elevated throughout the rehydration period, whereas in H2O, it returned to the control level by 30 min. The results suggest that poorer rehydration in H2O-R subjects was caused by both the removal of the osmotic drive for drinking and a rise in free water clearance, primarily due to the loss of electrolytes during dehydration. I.S.

A88-48327
CORRELATION BETWEEN THE ORGANISM RESPONSE TO ACUTE HYPOXIA AND INDIVIDUAL RADIOSENSITIVITY OF RATS [SOOTNOSHENIE MEZHDU KOMPLEKSOM REAKTSII ORGANIZMA NA VOZDEISTVIE OSTROI GIPOKSII I INDIVIDUAL'NOI RADIOCHUVSTVITEL'NOST'IU PRI OBLUCHENII V DOZE 200 GR]
A. IU. GRIGOR'EV and D. IA. SILIN (Ministerstvo Zdravookhraneniia SSSR, Institut Biofiziki, Moscow, USSR) Radiobiologiia (ISSN 0033-8192), vol. 28, May-June 1988, p. 368-371. In Russian. refs

A study was made of a correlation between the response of basal metabolism to acute hypoxia and the life span of rats after irradiation resulting in the development of a cerebral form of radiation sickness. The more radiosensitive animals consumed a larger amount of oxygen, exhaled a lesser amount of carbon dioxide, and showed an increased normal expiratory exchange per minute. After the effect of acute hypoxia all the indices under study exhibited an opposite picture. Author

A88-48727
EFFECT OF MICROCLIMATE ON ADAPTATION OF SEAMEN DURING VOYAGES AT LOW LATITUDES [VLIIANIE MIKROKLIMATA NA ADAPTATSIIU MORIAKOV PRI PLAVANII V NIZKIKH SHIROTAKH]
N. N. PLAKHOV and L. G. TEPINA Voenno-Meditsinskii Zhurnal (ISSN 0026-9050), May 1988, p. 51-53. In Russian. refs

The effect of an air-conditioned (AC) environment on the primary adaptation reactions of seamen during low-latitude voyages to hot and humid climate was investigated by periodically measuring (at rest and after exercise) the heart rate, blood pressure, and other parameters of the thermoregulatory system in the subjects of three experimental groups. The subjects of the first group worked and rested in an AC environment (at 24-27 C, and 50-70 percent relative humidity); the subjects of the second group worked in the open (at 28 to 41 C and 50 to 90 percent rel. humidity) but rested in AC rooms; the subjects of the third group worked in the open and rested in non-AC rooms (at 31-35 C and 60-90 percent rel. humidity). The results showed that, in the first period of the voyage, the characteristics of thermal adaptation were least favorable in the subjects of the third group, with many reactions

exceeding physiological norms. The regime of the second group (i.e., step-adaptation) was found to be the most favorable one. Limited exposures to a hot environment resulted in adequate adaptation without signs of excessive stress. I.S.

A88-49027
MULTIATTRIBUTE MODELING ANALYSIS OF THE EFFECTS OF A LOW BLOOD ALCOHOL LEVEL ON PILOT PERFORMANCE
LEONARD E. ROSS and JAMES C. MUNDT (Wisconsin, University, Madison) Human Factors (ISSN 0018-7208), vol. 30, June 1988, p. 293-304. refs
(Contract PHS-AA-6093)

Multiattribute modeling procedures were used to evaluate the flight performance of pilots who completed a simulator flight under 0 and 0.04 percent blood alcohol concentration (BAC) conditions. The flight involved VOR tracking, vectoring, traffic avoidance, and descent. Flight instructors' judgments were used to develop a multiattribute model of flight performance that permitted evaluation of the effects of alcohol on overall flight performance, as well as on task segment and performance aspect components of the flight. Alcohol was found to have a significant deleterious effect on overall pilot performance and on some of the task segments. The multiattribute modeling approach was found to be useful in providing a task analysis function that permitted alcohol effects to be evaluated in a manner that reflected pilot concentration on some aspects of the flight task at the expense of others. Author

N88-26018# GKSS-Forschungszentrum Geesthacht (West Germany).
EXPERIENCE IN OCCUPATIONAL MEDICINE, DERIVED FROM 16 OPERATIONAL DEEP SATURATION TRIMIX 5 DIVES IN GUSI FROM 150 TO 600 M
JUSTUS HOLTHAUS *In* ESA, Proceedings of the Colloquium on Space and Sea p 25-29 Mar. 1988
Avail: NTIS HC A15/MF A01

Based upon the physiological experience mainly of the Atlantis dive series, 16 operational deep saturation dives with 64 man dives, 1467 man days were performed in a strictly mono-parametrical way from 150 to 600 m, using 14 divers from different nations. Occupational health problems related to deep diving, hygiene, work, and intercurrent diseases are described. Conclusions are: safe operational diving is standard down to 300 m. Industrial application offshore is feasible to 450 m. The problems in the diving range from 450 to 600 m (HPNS, DCS, osteonecrosis) are still not satisfactorily solved. Neurological longterm effects have, so far not been observed. ESA

N88-26019# Compagnie Maritime d'Expertises, Marseille (France). Hydra Research Programme.
LIFE IN A HYPERBARIC ENVIRONMENT. A NEW O2-H2 BREATHING MIXTURE FOR INDUSTRIAL DIVING
BERNARD GARDETTE, M. COMET, C. GORTAN, J. P. IMBERT, X. FRUCTUS, and H. G. DELAUZE *In* ESA, Proceedings of the Colloquium on Space and Sea p 31-40 Mar. 1988
Avail: NTIS HC A15/MF A01

A hydrogen/helium/oxygen gas mixture to open up the 300 to 600 m (1000 to 2000 ft) depth range to manned diving operations is introduced. Safety analyses and tests on mice and men are reviewed. The results of the use of hydrogen as a diluent for oxygen, either alone or in combination with helium, are positive. Once technical problems (such as oxygen adds, hydrogen leakage and removal) are overcome, and the handling mastered, this gas constitutes a solution to life under pressure. By virtue of its lightness and its anti-HPNS effect it gives the deep diver much greater comfort than heliox, which beyond 250 m depth induces joint pain, tremor, myoclonia, the muscular tension in turn lowering psychomotor performance, plus respiratory problems, reduced alertness, and poor sleep patterns. A diver breathing hydrogen is more efficient, less tired, and more comfortable, thus much safer while working in the water. ESA

N88-26020# Reims Univ., France. Lab. de Psychologie Appliquee.
STRESS IN RELATION TO THE PHYSICAL AND SOCIAL ENVIRONMENT [STRESS EN RAPPORT AVEC L'ENVIRONNEMENT PHYSIQUE ET SOCIAL]
JEAN RIVOLIER *In* ESA, Proceedings of the Colloquium on Space and Sea p 41-45 Mar. 1988 In FRENCH
Avail: NTIS HC A15/MF A01

A man-environment interactional approach to stress is proposed, and the need to consider three levels, emotional, behavioral, and biological, is shown. The usefulness of wintering in polar regions to study manifestations of stress, in particular in relation to soft stressors associated with long stays in isolated conditions in enclosed spaces, is presented. A method for selecting, training, and following up teams to be sent to the poles is suggested. Polar simulation of stressing conditions likely to be met by space crews is proposed. ESA

N88-26029# Direction des Constructions et Armes Navales, Toulon (France). Centre d'Etudes et de Recherche Techniques Sous-Marines.
CONTRIBUTION OF ULTRASONIC DOPPLER DETECTION OF CIRCULATING BUBBLES TO HUMAN INTERVENTIONS UNDER THE SEA AND IN SPACE [APPORT DE LA DETECTION ULTRASONORE PAR EFFET DOPPLER DES BULLES CIRCULANTES AUX INTERVENTIONS HUMAINES EN MER ET DANS L'ESPACE]
GERARD MASUREL, R. GUILLERM, and L. GIACOMONI *In* ESA, Proceedings of the Colloquium on Space and Sea p 99-102 Mar. 1988 In FRENCH
Avail: NTIS HC A15/MF A01

The effect of hypo and hyperbaric pressure on the formation of bubbles in the blood was studied using Doppler ultrasonic detection. Study of bubble initiation enables the optimization of decompression procedures for deep sea divers and spacemen after extravehicular activity. Results obtained on human and animal subjects in underwater and high altitude tests are shown. ESA

N88-26035# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Inst. for Aerospace Medicine.
DECOMPRESSION PROCEDURES AND ACCIDENTS IN SPACE AND SEA
JUERGEN WENZEL and L. VOGT *In* ESA, Proceedings of the Colloquium on Space and Sea p 139-147 Mar. 1988
Avail: NTIS HC A15/MF A01

The physiology and chemistry of breathing under normal terrestrial conditions and under the abnormal conditions encountered in diving underwater and in space extravehicular activity are reviewed. Decompression procedures used to prevent bubbles forming in the blood are summarized. Treatments for decompression sickness are indicated. ESA

N88-26070# Joint Publications Research Service, Arlington, Va.
RESULTS OF MEDICAL RESEARCH CONDUCTED IN 1985 DURING LONG-TERM SPACEFLIGHTS
A. D. YEGOROV, O. D. ANASHKIN, O. G. ITSEKHOVSKIY, I. V. ALFEROVA, Z. A. GOLUBCHIKOVA, V. R. LYAMIN, A. P. POLYAKOVA, V. F. TURCHANINOVA, V. A. TALAVRINOV, and V. D. TURBASOV *In its* JPRS Report: Science and Technology. USSR: Space Biology and Aerospace Medicine, v. 22, no. 1, Jan.-Feb. 1988 p 1-4 23 Jun. 1988 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina, Moscow (USSR), v. 22, no. 1, Jan.-Feb. 1988 p 4-7
Avail: NTIS HC A08/MF A01

Medical results obtained during the fourth expedition of five cosmonauts onboard orbital complexes Salyut T - Soyuz T-13 and Salyut 7 - Soyuz T-14 are presented. The cardiovascular system was examined using 36 resting and provocative tests. They were performed by means of electrocardiography, tetrapolar rheography, arteriovenous pulsography and tachooscillography. In addition, body mass and leg volume were measured. The above parameters showed typical variations as well as individual changes related to

the preflight circulation level and environmental effects. The use of modified regimens of provocative tests demonstrated their applicability to the assessment of cardiovascular function in space flight. Author

N88-26071# Joint Publications Research Service, Arlington, Va.
HUMAN HEMODYNAMICS DURING WATER IMMERSION AS RELATED TO POSITION DURING SUBMERSION
A. M. GENIN, A. YU. MODIN, and V. S. SHASHKOV *In its* JPRS Report: Science and Technology. USSR: Space Biology and Aerospace Medicine, v. 22, no. 1, Jan.-Feb. 1988 p 5-8 23 Jun. 1988 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina, Moscow (USSR), v. 22, no. 1, Jan.-Feb. 1988 p 7-10
Avail: NTIS HC A08/MF A01

Central and peripheral hemodynamics were investigated in 16 essentially healthy volunteers who performed a routine tilt test or a tilt test in water immersion. Unlike tilt tests carried out before water immersion, the supine to upright transfer in water did not change cardiac rhythm, cardiac output, leg blood flow or other circulation parameters. The fact that there are no posture related circulation changes in water immersion suggests that the horizontal and upright positions in water can be viewed as hemodynamically similar. Author

N88-26072# Joint Publications Research Service, Arlington, Va.
HEMOSTASIS PARAMETERS OF INDIVIDUALS WITH NEUROCIRCULATORY DYSTONIA SUBMITTED TO DRY IMMERSION
L. L. KIRICHENKO, V. P. MASENKO, A. B. RASKURAZHEV, and A. G. YEVDOKIMOVA *In its* JPRS Report: Science and Technology. USSR: Space Biology and Aerospace Medicine, v. 22, no. 1, Jan.-Feb. 1988 p 9-12 23 Jun. 1988 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina, Moscow (USSR), v. 22, no. 1, Jan.-Feb. 1988 p 10-13
Avail: NTIS HC A08/MF A01

Twelve volunteers, aged 45 to 55 years, with hypertension type neurocirculatory dystonia were exposed to 7 day dry immersion. Plasma, platelet and vessel hemostasis was investigated. Dry immersion was found to stimulate hypercoagulatory changes in the above hemostasis systems. It was also shown that the test subjects developed a slow process of readaptation. Author

N88-26073# Joint Publications Research Service, Arlington, Va.
SIGNIFICANCE OF NUTRITION TO CHANGE IN HUMAN CARBOHYDRATE AND LIPID METABOLISM UNDER EMOTIONAL STRESS
V. P. BYCHKOV, L. I. MOSYAKINA, and O. S. KHOKHLOVA *In its* JPRS Report: Science and Technology. USSR: Space Biology and Aerospace Medicine, v. 22, no. 1, Jan.-Feb. 1988 p 13-17 23 Jun. 1988 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina, Moscow (USSR), v. 22, no. 1, Jan.-Feb. 1988 p 13-17
Avail: NTIS HC A08/MF A01

Two experiments were performed on 16 test subjects (13 men and 3 women) to study stress effects on the blood content of sugar and cholesterol. The test subjects were given a nutritionally balanced diet of canned foodstuffs. The caloric value of the diet was adequate to energy expenditures. In the first experiment, the test subjects were also given vitamin E, nicotinic acid and other vitamins constituting the polyvitamin complex Aerovit. In the second experiment, they were additionally given calcium and potassium salts, glucose and phosphatide concentrate. The stress agent was a test in the rotating chair in the first experiment and a psychologic test (mental work within a limited period of time to reach success or failure) in the second experiment. The content of sugar and cholesterol before and after the stress effects did not differ significantly. This can be attributed to the prophylactic effect of the nutritional factor on carbohydrate and lipid metabolism in an emotionally stressed man. Author

N88-26074# Joint Publications Research Service, Arlington, Va.
ANALYSIS OF CLINICAL SYMPTOMS OF HUMAN DECOMPRESSION SICKNESS DURING ALTITUDE CHAMBER STUDIES
L. R. ISEYEV, A. S. TSIVILASHVILI, and V. I. CHADOV *In its* JPRS Report: Science and Technology. USSR: Space Biology and Aerospace Medicine, v. 22, no. 1, Jan.-Feb. 1988 p 18-22 23 Jun. 1988 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina, Moscow (USSR), v. 22, no. 1, Jan.-Feb. 1988 p 17-21
Avail: NTIS HC A08/MF A01

Over 2400 altitude chamber ascents in which 130 volunteers participated were performed using different decompression tables. The cases of decompression disease were classified in terms of its types and severity. It is stressed that the experimenters involved in decompression studies have to be extremely careful because the disease may have various and sudden manifestations. Author

N88-26075# Joint Publications Research Service, Arlington, Va.
ELECTROENCEPHALOGRAPHIC CHANGES DURING EQUILIBRIUM TEST IN THE PRESENCE OF RHYTHMIC PHOTIC INTERFERENCE
YE. T. PETRENKO *In its* JPRS Report: Science and Technology. USSR: Space Biology and Aerospace Medicine, v. 22, no. 1, Jan.-Feb. 1988 p 23-28 23 Jun. 1988 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina, Moscow (USSR), v. 22, no. 1, Jan.-Feb. 1988 p 21-25
Avail: NTIS HC A08/MF A01

Reliable diagnosis of Central Nervous System (CNS) noise resistance is important in the selection of operators and pilots. A study was performed to investigate neocortex biopotentials of 74 subjects during equilibrium tests in the presence or absence of 123 Hz light flashes. Electrical cardiographic and stabilographic recordings were taken from 6 sites of the left neocortex during equilibrium tests and during light stimulation. EEG's were processed through correlation spectral analysis by computers. During light stimulation 35 nonsusceptible subjects maintained equilibrium for as long as 80 to 100 percent of the normal time, while 39 susceptible subjects maintained it for only 10 to 30 percent. In response to light stimulation susceptible subjects showed distinct rearrangement of the autospectral and coherence functions. Certain changes in the spectral analysis were more pronounced in the neocortex areas related to movement organization, viz. premotor, motor and sensorimotor areas. In the nonsusceptible subjects light stimulation induced no changes in the EEG. It is concluded that noise resistance of the motor control system depends on the CNS capacity to prevent the rhythm of light stimulation to occur in EEG's of motor areas. Author

N88-26077# Joint Publications Research Service, Arlington, Va.
NONINVASIVE EXAMINATION OF BONES DURING LONG-TERM HYPOKINESIA
V. S. OGANOV, A. S. RAKHMANOV, B. V. MORUKOV, KH. A. YANSON, A. M. TATARINOV, V. YE. ZAYCHIK, S. K. TERNOVOY, and C. CANN *In its* JPRS Report: Science and Technology. USSR: Space Biology and Aerospace Medicine, v. 22, no. 1, Jan.-Feb. 1988 p 35-40 23 Jun. 1988 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina, Moscow (USSR), v. 22, no. 1, Jan.-Feb. 1988 p 30-33
Avail: NTIS HC A08/MF A01

The effect of 120 day bed rest on skeletal bones of 25 volunteers was investigated by noninvasive methods, viz. gamma photon absorption, ultrasonic and neutron activation analysis. The subjects were divided into 4 groups, one of which served as control and three others used different countermeasures (drugs, exercise or drugs in combination with exercise). Calcium loss in skeletal bones was not more than 0.5 percent per month; calcium loss in leg tubular bones was 1 to 2 percent per month in 6 subjects; calcium loss in heel bones was on the average 3 to 4 percent per month in the control, exercise and combination groups. No strict correlation between the negative balance of calcium and mineral content in leg compact bones and foot spongy bones

was found. There was a correlation between changes in the mineral content of leg bones and ultrasound propagation along certain compartments of the tibial median surface. In terms of negative and positive trends, leg and foot bones were in better condition in the drug group. The techniques used were assessed with respect to their diagnostic and prognostic value. Author

N88-26081# Joint Publications Research Service, Arlington, Va.
EFFECT OF LOW-FREQUENCY WHOLE-BODY VERTICAL VIBRATION ON THE SEROTONINERGIC SYSTEM OF THE BRAIN AND SPINAL CORD
A. S. DMITRIYEV and G. K. TROPNIKOVA *In its* JPRS Report: Science and Technology. USSR: Space Biology and Aerospace Medicine, v. 22, no. 1, Jan.-Feb. 1988 p 58-63 23 Jun. 1988 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina, Moscow (USSR), v. 22, no. 1, Jan.-Feb. 1988 p 45-49
Avail: NTIS HC A08/MF A01

Rat experiments were performed to study variations in serotonin (5-HT) and its metabolite (5 hydroxy indole acetic acid) in different central nervous system compartments. Control animals were exposed to an acute vibration stress (10 Hz, 1 mm, 2 m/sq sec, 15 min) and experimental animals to a prolonged (52 to 54 days) vibration test. Acute vibration led to 5-HT activation which was most significant in the hippocampus, diencephalon, cerebellum and in the sacrolumbar cord. Prolonged vibration caused an increase of 5-HT in the parietal cortex and its enhanced utilization in the striatum, diencephalon, pons and in the sacrolumbar cord. As compared to the controls, vibration produced a smaller acculumation of 5-HT in the hippocampus and a larger accumulation in the cerebellum, diencephalon, medulla oblongata and spinal cord. The role is discussed of regional changes in 5-HT metabolism and reactivity of serotoninergic structures in the mechanism of vibration related somatosensory disorders. Author

N88-26082# Joint Publications Research Service, Arlington, Va.
DISTINCTIVE FEATURES IN BLOOD CLOTTING AND FIBRINOLYTIC PROPERTIES UNDER EFFECT OF EPINEPHRINE IN PRESENCE OF HYPOXIA AND HYPERCAPNIA
G. D. PAK, V. S. SVERCHKOV, T. N. DANILEVSKAYA, and T. P. TRANDAFILOVA *In its* JPRS Report: Science and Technology. USSR: Space Biology and Aerospace Medicine, v. 22, no. 1, Jan.-Feb. 1988 p 64-69 23 Jun. 1988 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina, Moscow (USSR), v. 22, no. 1. Jan.-Feb. 1988 p 49-53
Avail: NTIS HC A08/MF A01

Acute experiments were carried out on 50 dogs to study the effect of epinpehrine in hypoxic (N2-15 to 10 percent O2) or hypoxic-hypercapnic (N2-10 percent O2-5 percent CO2) atmospheres. Epinephrine led to a maximum increase of blood coagulation and fibrinolysis in normoxic atmosphere. Hypoxia reduced the shift of most hemostasis parameters in response to epinephrine. However, in N2-10 percent O2 atmosphere the epinephrine induced increase of blood coagulation was superimposed on initial hypoxic hypercoagulation and caused serious disorders in hemostasis. In hyperoxic-hypercapnic atmosphere, increase of blood coagulation in response to epinephrine was more than doubled when compared to that in hypoxic atmosphere, reaching control values. Nevertheless, after epinephrine administration, the ratio of coagulatory, anticoagulatory and fibrinolytic activities was more beneficial in hypoxia-hypercapnia and the coagulation potential was lower than in hypoxic or normoxic atmospheres. Author

N88-26084# Joint Publications Research Service, Arlington, Va.
EFFECT OF LONG-TERM INHALATION OF ACETIC ACID VAPOR ON SOME FUNCTIONAL PARAMETERS OF MAN
V. P. SAVINA and B. V. ANISIMOV *In its* JPRS Report: Science and Technology. USSR: Space Biology and Aerospace Medicine, v. 22, no. 1, Jan.-Feb. 1988 p 77-82 23 Jun. 1988 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina, Moscow (USSR), v. 22, no. 1, Jan.-Feb. 1988 p 57-61
Avail: NTIS HC A08/MF A01

Test subjects were continuously exposed to acetic acid vapors which form a constant component of enclosed atmospheres. The inhalation time was 15 to 22 days at concentrations of 5, 10 and 15 mg/cu m or 10 days at a concentration of 26 mg/cu m. Physiological parameters showed statistically significant changes at concentrations of 15 and 26 mg/cu m. It is suggested that the changes are not adaptive but have been produced by the adverse effect of acetic acid vapors on the human body. It is therefore concluded that the 15 mg/cu m concentration is threshold and the 5 and 10 mg/cu m concentrations are ineffective in terms of the tests used. The most sensitive method is measurement of hydrocarbons (C2 to C5), especially ethylene, in the exhaled air. Author

N88-26088# Joint Publications Research Service, Arlington, Va.
METHOD OF ASSESSING CHANGES IN BIORHYTHMOLOGICAL STRUCTURE OF HUMAN PHYSIOLOGICAL FUNCTIONS
I. F. VAYSBURD *In its* JPRS Report: Science and Technology. USSR: Space Biology and Aerospace Medicine, v. 22, no. 1, Jan.-Feb. 1988 p 99-106 23 Jun. 1988 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina, Moscow (USSR), v. 22, no. 1, Jan.-Feb. 1988 p 71-73
Avail: NTIS HC A08/MF A01

Investigation of functional changes in man over a 24 hr period is an important task for space medicine. Individual cosinor analysis (ICA), which involves creation of models of baseline data in the form of appropriate combinations of algebraic and trigonometric functions, has gained the greatest popularity. The method proposed calls for analysis of variability of three parameters of a cosinor model (mean level, acrophase and amplitude) obtained for sliding observation intervals. The following objectives are set: to assess the degree of adaptation of the time structure of human physiological functions to extreme factors, and to describe quantitatively the wandering zone not only of acrophases, but other biorhythm parameters, lability or stability of the circadian system. The method is illustrated and discussed. Author

N88-26092# Joint Publications Research Service, Arlington, Va.
HUMAN ERYKTHROCYTE METABOLISM IN THE PRESENCE OF HYPEROXYGENATION DURING ANTIORTHOSTATIC HYPOKINESIA
V. YE. VOROBYEV, V. F. IVCHENKO, and L. L. STAZHADZE *In its* JPRS Report: Science and Technology. USSR: Space Biology and Aerospace Medicine, v. 22, no. 1, Jan.-Feb. 1988 p 117-118 23 Jun. 1988 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina, Moscow (USSR), v. 22, Jan.-Feb. 1988 p 81-82
Avail: NTIS HC A08/MF A01

A study of the effects of high concentrations of oxygen at normal barometric pressure should include evaluation of respiratory function of blood, which serves as the central element in the transport of gases, connecting external and tissue respiration. The question of effect of high oxygen concentrations on respiratory function of blood is of some interest to space biology and medicine. In particular, it is important to understand how red cell metabolism, which is one of the limiting factors of maximum permissible exposure of man to a hyperoxic environment, changes under normobaric hyperoxic conditions. However, there is very sparse information about erythrocyte metabolism in weightlessness or conditions that simulate it. Some of the mechanisms in the system of the blood's response to hyperoxia in healthy people was investigated in a series of studies using antiorthostatic hypokinesia. Author

N88-26093# Joint Publications Research Service, Arlington, Va.
EFFECT OF DIFFERENT MODES OF VOLUNTARY CONTROL OF BREATHING ON HUMAN ELECTROENCEPHALOGRAM WITH EXPOSURE TO ACUTE HYPOXIC HYPOXIA
YE. P. GORA *In its* JPRS Report: Science and Technology. USSR: Space Biology and Aerospace Medicine, v. 22, no. 1,

Jan.-Feb. 1988 p 119-121 23 Jun. 1988 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina, Moscow (USSR), v. 22, Jan.-Feb. 1988 p 82-84
Avail: NTIS HC A08/MF A01

The search for means of enhancing effectiveness of human adaptation to low barometric pressure is of great scientific and practical importance to space biology and aerospace medicine. It is assumed that voluntary control of breathing may be one of the means of achieving this. At present there is no clear cut idea about the distinctions of the effect of voluntary control of breathing on change in functional state of the central nervous system and, in particular, electrical activity of the brain during adaptation to acute hypoxic hypoxia. The mechanisms of this feedback was investigated using some modes of voluntary control of respiration during exposure to acute hypoxia corresponding to an altitude of 5000 m. Methods and results are discussed. Author

N88-26094# Joint Publications Research Service, Arlington, Va.
EXPERIMENTAL STUDY OF PROTECTIVE EFFECT OF ANTIOXIDANT ENZYMES-SUPEROXIDE DISMUTASE AND CATALASE-WHEN USING INTERMITTENT TOXIC MODES OF HYPERBARIC OXYGENATION
F. A. ZVERSHKHANOVSKIY, M. A. SIMONYAN, and YU. A. PILIPENKO *In its* JPRS Report: Science and Technology. USSR: Space Biology and Aerospace Medicine, v. 22, no. 1, Jan.-Feb. 1988 p 122-125 23 Jun. 1988 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina, Moscow (USSR), v. 22, Jan.-Feb. 1988 p 84-86
Avail: NTIS HC A08/MF A01

Formation in the body of active forms of oxygen is the triggering factor of oxygen intoxication when using toxic modes of hyperbaric oxygenation (HBO); they have the capacity to react with endogenous substrates with formation of organic peroxides. Peroxide compounds have an inactivating effect on oxide reductase, as a result, the cell loses the capacity to utilize surplus oxygen. Superoxide dismutase (SOD), catalase and glutathione peroxide play an important role in dismutation of superoxide radicals. These enzymatic antioxidants (AO) manifest their stabilizing effect by inhibiting free radical oxidation of lipids in biological membranes. Exposure to toxic HBO is associated with decrease in activity of these AO, which leads to accumulation of lipid peroxides in excess of the physiological reserve of the antioxidant system. The prevention of the toxic effect of hyperbaric oxygen by means of administration of exogenous SOD and catalase was studied and is discussed. Author

N88-26095# Joint Publications Research Service, Arlington, Va.
METHOD FOR MEASURING ABSOLUTE LINEAR PARAMETERS OF CHROMOSOMES
L. I. CHABALA *In its* JPRS Report: Science and Technology. USSR: Space Biology and Aerospace Medicine, v. 22, no. 1, Jan.-Feb. 1988 p 126-128 23 Jun. 1988 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina, Moscow (USSR), v. 22, Jan.-Feb. 1988 p 86-87
Avail: NTIS HC A08/MF A01

Some attention is given to change in chromosome morphology in studies of the effects of spaceflight factors on the body. At present, the method of measuring chromosomes in relative units on microphotographs or drawings from a negative is used extensively. A method is known of measuring microscopic objects in microns under a microscope, using the scale of an eyepiece micrometer. When examining chromosomes under a microscope with a 90x lens, a 7x eyepiece is used, which has an attachment for the ocular micrometer. In this case, the ocular micrometer has a scale factor of 2 microns. But in some animal species, the chromosomes are about 2 microns in size. For them the above scale factor is rather large and does not permit accurate measurement. For this reason, a method was developed for measuring the absolute linear parameters of chromosomes, which will permit mass scale analysis with higher precision. Author

N88-26097# Signition, Inc., Los Alamos, N. Mex. Hearing Research Lab.
NOVEL NONLINEAR SIGNAL PROCESSING PRINCIPLES Final Report
GEORGE ZWEIG 30 Sep. 1987 6 p
(Contract N00014-86-C-0051)
(AD-A191644) Avail: NTIS HC A02/MF A01 CSCL 20A

Research has been directed towards discovering novel nonlinear signal processing principles by studying the way in which the inner ear analyzes sound and encodes the information contained therein as neural impulses. These principles may be abstracted from the context of hearing and usefully applied to the analysis of any type of nonstationary signal containing both time and frequency information. Applications of this work to the recognition of speech in noisy environments and the classification of ocean sounds are expected. The central research problem has been the characterization of the nonlinear mechanics of the inner ear and the elucidation of its role in signal processing. The mechanics of the inner ear at low sound pressure levels (levels of unvoiced speech) has been accurately characterized with the unexpected conclusion that the inner ear functions as an active nonlinear one-dimensional mechanical transmission line with negative feedback involving delay. The parameters defining the circuit elements vary gradually along the line. Each section of the line contains a negatively damped harmonic oscillator stabilized by the feedback of a force proportional to the displacement of the oscillator at a time in the past, where the time delay of the force is proportional to the oscillator's period. GRA

N88-26098# Helsinki Univ. of Technology, Espoo (Finland). Low Temperature Lab.
CONTRA- AND IPSILATERAL AUDITORY STIMULI PRODUCE DIFFERENT ACTIVATION PATTERNS AT THE HUMAN AUDITORY CORTEX: A NEUROMAGNETIC STUDY
J. P. MAEKELAE Feb. 1988 22 p
(PB88-181490; TKK-F-A625; ISBN-951-754-399-9) Avail: NTIS HC A03/MF A01 CSCL 06P

Auditory evoked magnetic fields were recorded over the right hemisphere of healthy humans. The stimuli were noise bursts presented either to the contra (C) or ipsilateral (I) ear in different combinations. The largest deflection of the responses, N100m (magnetic counterpart of electric N100), showed a field pattern which suggests activation of the supratemporal auditory cortex. in an oddball paradigm, where the standards (90 percent) were 400 ms noise bursts presented to the contralateral ear, and the deviants (10 percent) similar stimuli to the ipsilateral ear, the deviants elicited on the average 130 percent stronger equivalent dipoles of N100 m than the standards. When two 50 ms noise bursts, separted by 300 ms, were presented once every 2 s, N1000 m evoked by the second stimulus of the pair was smaller when the stimuli were presented monaurally (C - C or I - I) than to different ears (C - I, I - C). The results suggest that contra and ipsilateral auditory stimuli are analyzed, at least inpart, in different neural networks at the human auditory cortex. GRA

N88-26787# Joint Publications Research Service, Arlington, Va.
SIGNIFICANCE OF SENSORY SIGNAL PHASE MISMATCH IN MECHANISMS OF MOTION SICKNESS DEVELOPMENT Abstract Only
O. A. VOROBYEV *In its* JPRS Report: Science and Technology. USSR: Life Sciences p 1 10 Jun. 1988 Transl. into ENGLISH from Izvestiya Akademii Nauk SSSR, Seriya Biologicheskaya (Moscow, USSR), no. 5, Sep. - Oct. 1987 p 753-761
Avail: NTIS HC A03/MF A01

A study of features of combined stimulation of vestibular and extrapyrimidal structures under complex dynamic conditions, which produces motion sickness, with use of materials from the author's research and from the literature, is described and discussed. The study included electronystagmographic study of 6 males during performance of 3 versions of a test of the continuous effect of Coriolis accelerations. The study of the effect on man of angular, linear and Coriolis acceleration and opticokinetic stimuli confirmed that the susceptibility to motion sickness under complex dynamic

conditions is determined predominantly by the degree of phase mismatch of sensory signals of different analyzer systems. Types of motion sickness were examined from these positions. It was found that motion sickness results from volumetric excitation in the central nervous system, spreading to the higher autonomic centers, which may occur according to the holographic principle of conversion of sensory signals with phase heterogeneity. This suggests that phase mismatch of sensory signals play a major part in development of motion sickness. Author

N88-26788# Joint Publications Research Service, Arlington, Va.
BIORHYTHMS OF BINOCULAR VISION Abstract Only
T. P. TETERINA, V. V. VOLKOV, and L. P. KOCHETKOVA *In its* JPRS Report: Science and Technology. USSR: Life Sciences p 15 10 Jun. 1988 Transl. into ENGLISH from Fiziologiya Cheloveka (Moscow, USSR), v. 13, no. 5, Sep. - Oct. 1987 p 779-782 Original language document was announced in IAA as A88-18033
Avail: NTIS HC A03/MF A01

The biorhythms of monocular perception in the processes of binocular fixation were investigated together with the effects of the subjects' age and physical load on the rhythms. It was found that, during binocular fixation of an immobile object in free space, there takes place a rhythmic synchronous alternation of the monocular perceptions by each of the two eyes. Average rhythm frequency in subjects with normal binocular vision was found to be 10.9 + or - 0.3/min, with a period duration of about 4.78/sec and a monocular phase duration of between a fraction of a second and 1 to 3 seconds. Monocular rhythm frequency varied during the 24 hr period, being lowest in the morning and highest around 6 PM. The rhythm frequency was found to be also affected by the age of an individual, being higher in young adults than in children aged 10 to 14 years, and by exercise, which increased the rhythm frequency. E.R.

N88-26789# Joint Publications Research Service, Arlington, Va.
METHOD FOR OBSERVING CHANGES IN FUNCTIONAL STATE OF HUMAN OPERATOR Abstract Only
B. M. VLADIMIRSKIY and L. A. VLASKINA *In its* JPRS Report: Science and Technology. USSR: Life Sciences p 16 10 Jun. 1988 Transl. into ENGLISH from Fiziologiya Cheloveka (Moscow, USSR), v. 13, no. 5, Sep. - Oct. 1987 p 863-865
Avail: NTIS HC A03/MF A01

A method of diagnosing the functional state of a human operator was developed and checked experimentally. Correlation coefficients of instantaneous values of EEG amplitude, recorded in three symmetric zones of the cerebral cortex, served as starting material. Correlation coefficients (4 to 6 out of 15 possible) which differed the most in their mean values during transition from one functional state to another were used. Construction of a correlation coefficient matrix for correlation coefficient values selected at the preceding stage and subsequent analysis of the main components revealed change of functional state with great accuracy. Indicators of time-space organization of EEG activity revealed in the diagnosis were individually stable and can be used to construct psychophysiologic portraits of specific operators. Tracking the functional state of a human operator during fatigue development was used to check the effectiveness of the method. Author

N88-26796# Helsinki Univ. of Technology, Espoo (Finland). Low Temperature Lab.
AUDITORY EVOKED MAGNETIC FIELDS IN MAN
J. MAEKELAE 1988 68 p
(PB88-193446; ISBN-951-754-430-8) Avail: NTIS HC A04/MF A01 CSCL 06S

In understanding responses to complex stimuli, required to illuminate properties unique to human Central Nervous System, it is useful to understand responses to simpler forms of the stimuli. Noise bursts, frequency and amplitude modulations, and constant frequency quasiperiodic sounds are acoustic constituents of speech. Magnetic responses to such stimuli are described. In order to analyze the neural sources of auditory evoked responses and to clarify the functional properties of the human supratemporal auditory cortex, auditory evoked magnetic fields to different stimuli were studied in healthy humans and in one deaf patient with a cochlear implant. Author

N88-26797# Brookhaven National Lab., Upton, N. Y.
ACUTE RADIATION SYNDRONES AND THEIR MANAGEMENT
E. P. CRONKITE 1988 36 p Presented at the International Conference on Biological Effects of Large Doses of Ionizing and Non-ionizing Radiation, Hangzhou, People's Republic of China, 26 Mar. 1988
(Contract DE-AC02-76CH-00016)
(DE88-009839; BNL-41186; CONF-880394-2) Avail: NTIS HC A03/MF A01

Radiation syndromes produced by large doses of ionizing radiation are divided into three general groups depending on dose of radiation and time after exposure. The CNS syndrome requires many thousands of rad, appears in minutes to hours, and kills within hours to days. The GIS appears after doses of a few hundred to 2000 rad. It is characterized by nausea, vomiting, diarrhea, and disturbances of water and electrolyte metabolism. It has a high mortality in the first week after exposure. Survivors will then experience the HS as a result of marrow aplasia. Depending on dose, survival is possible with antibiotic and transfusion therapy. The relationship of granulocyte depression to mortality in dogs and human beings is illustrated. The role of depth dose pattern of mortality of radiation exposure is described and used as an indication of why air exposure doses may be misleading. The therapy of radiation injury is described based on antibiotics, transfusion therapy, and use of molecular regulators. The limited role of matched allogenic bone marrow transplants is discussed. DOE

N88-26798# State Univ. of New York at Buffalo, Amherst.
THE INTERACTION OF SENSORY AND PERCEPTUAL VARIABLES: SPATIAL, TEMPORAL AND ORIENTATION RESPONSE TO FIGURE AND GROUND Final Report, 1 Jun. 1984 - 31 Aug. 1987
NAOMI WEISSTEIN 25 Feb. 1988 34 p
(Contract AF AFOSR-0115-84)
(AD-A192897; AFOSR-88-0282TR) Avail: NTIS HC A03/MF A01 CSCL 05H

Numerous experimental observations support the principal investigator's conjecture that human visual segmentation of figure and ground is partly determined by properties of the visual scene. Support derives from observations that: figure and ground occupy different perceptual depth planes; perceived differences of depth are necessary for figure-ground segmentation; patches of an image are assigned to depth planes partly on the basis of their relative spatial frequency content, temporal frequency content (distinguished from perceived velocity), and retinal disparity. Details of these and other experiments are included with discussion and references. GRA

N88-26799# Technische Univ., Munich (West Germany). Flugmedizinischen Inst. Fuerstenfeldbruck.
DOES DIHYDROERGOTAMINE USED IN THERAPEUTICAL DOSES INFLUENCE THE PHYSICAL AND PSYCHOMOTOR PERFORMANCE OF YOUNG PILOTS OR OTHER TRAFFIC DRIVERS SUBJECTED TO HYPOTONIA? Ph.D. Thesis [BEEINFLUSST DIHYDROERGOTAMIN IN THERAPEUTISCH GEBRAEUCHLICHEN DOSEN DIE PHYSISCHE UND PSYCHOMOTORISCHE LEISTUNGSFAEHIGKEIT ZUR HYPOTONIE NEIGENDER JUGENDLICHER PILOTEN ODER SONSTIGER VERKEHRSTEILNEHMER?]
KURT POEMP 1986 63 p In GERMAN
(ETN-88-92136) Avail: NTIS HC A04/MF A01

Dihydroergotamine retard is studied on human physical and psychomotor performance in clinical tests relative to its action on orthostatic symptoms. Results on 23 young pilots with orthostatic misregulation indicates that this medicine improves physical performance without negative effects on psychomotricity. This medicine is well adapted to pilots and drivers. ESA

N88-26800* NASA Scientific and Technical Information Facility, Baltimore-Washington International Airport, Md. 21240.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 313)
Aug. 1988 73 p
(NASA-SP-7011(313); NAS 1.21:7011(313)) Avail: NTIS HC A05 CSCL 06E

This bibliography lists 227 reports, articles, and other documents introduced into the NASA scientific and technical information system in July, 1988. Author

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BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

A88-46428
THE ACQUISITION AND USE OF FLIGHT SIMULATION TECHNOLOGY IN AVIATION TRAINING - KEYNOTE ADDRESS
K. J. STAPLES (Royal Aircraft Establishment, Farnborough, England) IN: The acquisition and use of flight simulation technology in aviation training; Proceedings of the International Conference, London, England, Apr. 27-29, 1987. Volume 1. London, Royal Aeronautical Society, 1987, p. 4-8.

Most of the technological advancements required for successful flight simulation have been accomplished or will shortly be accomplished; attention is presently given to suggestions for further refinement that will lead to not only greater performance capabilities but also reduced costs. Attention is drawn to results from perceptual psychology research which suggest that efforts to ascertain what is essential in a simulator for the required effect on an operator is miniscule by comparison to the amount spent on advanced technology. O.C.

A88-46430
THE ACQUISITION AND USE OF FLIGHT SIMULATORS IN QANTAS
G. S. K. LINDEMAN and R. L. PAGE (Qantas Airways, Ltd., Sydney, Australia) IN: The acquisition and use of flight simulation technology in aviation training; Proceedings of the International Conference, London, England, Apr. 27-29, 1987. Volume 1. London, Royal Aeronautical Society, 1987, p. 41-52.

Flight simulators used by airlines must be capable of progressive updating to ensure training methods' fidelity to newly acquired aircraft flight characteristics, and to allow the incorporation of novel and more highly refined simulation system components. Attention is presently given to the simulator-related practices of a major airline, which employs them for regular cyclic crew training, windshear-response training, low-visibility training, airport qualifications, and ground-engineer training. O.C.

A88-46432
INTEGRATED GROUND TRAINING FOR THE BAE ATP
A. MCDICKEN (British Aerospace, PLC, Manchester, England) IN: The acquisition and use of flight simulation technology in aviation training; Proceedings of the International Conference, London, England, Apr. 27-29, 1987. Volume 1. London, Royal Aeronautical Society, 1987, p. 118-134.

An account is given of the design features and effectiveness of the Computer-Aided Training (CAT) integrated ground training simulator program devised for the conversion of qualified commuter airliner pilots and engineers to the new Advanced Turboprop aircraft. CAT methods are employed throughout the course, which encompasses an initial real-time simulation of systems by means of computer graphics and touch-screen control, then orientation/procedures training, and finally a six-degrees-of-freedom flight simulator. O.C.

A88-46444
FLIGHT SIMULATOR TRAINING EFFECTIVENESS RESEARCH IN U.S. ARMY AVIATION
THOMAS M. LONGRIDGE (U.S. Army, Research Institute, Fort Rucker, AL) IN: The acquisition and use of flight simulation technology in aviation training; Proceedings of the International Conference, London, England, Apr. 27-29, 1987. Volume 2. London, Royal Aeronautical Society, 1987, p. 356-390. refs

The results of rotary-wing flight simulator research conducted on backward transfer, in-simulator skill acquisition, and forward transfer of training pertinent to the skill sustainment of operational aviators at field locations is presented. The findings underscore the dictum that effective training is unlikely to occur if the simulator is treated as a substitute for the aircraft. A methodology being initiated to quantify the skill sustainment effectivness of field simulators is reviewed. B.J.

A88-46573#
A STUDY ON VISUAL INFORMATION PROCESSING UNDER MULTI-TASK CONDITION. I - DISPLAY DENSITY AND SEARCH TIME
ZOJIRO KATOH, YUKO NAGASAWA, and ATSUSHI KADOO Japan Air Self Defence Force, Aeromedical Laboratory, Reports (ISSN 0023-2858), vol. 28, Sept. 1987, p. 63-77. In Japanese, with abstract in English. refs

An experimental study of the relationship between time of search for a simple target and display density under dual-task conditions is reported. It was found that the search time and its standard deviation increased under both single- and dual-task conditions as the number of stimuli of the same display size increased. Under dual-task conditions, increment ratios of search time and standard deviation markedly changed at 0.06 and 0.08 of display density compared to the single-task condition. The increment of the number of stimuli within the same display size had a linear relationship to the increment of search time under the dual-task condition. It is suggested that when the same number of stimuli is presented at a different density, the function relating visual search time increment and display density is U-shaped. Scanning time per element decreased as the number of displayed stimuli increased. C.D.

A88-46975
THE INTERACTION BETWEEN VISUALLY INDUCED MOTION AND PHYSICAL MOTION IN A FLIGHT SIMULATOR
L. D. REID, P. R. GRANT, and G. L. GREIG (Toronto, University, Downsview, Canada) IN: 1987 Annual Summer Computer Simulation Conference, 19th, Montreal, Canada, July 27-30, 1987, Proceedings. San Diego, CA, Society for Computer Simulation, 1987, p. 724-729. NSERC-supported research.

Experiments have been performed to evaluate the effects of visual displays, particularly displays which cause vection, on the motion sensitivity of humans in the simulator environment. For the case of low-frequency large-amplitude sinusoidal displays, the subject's ability to detect motion congruent with the sinusoidal display was found to be severely hindered. High-amplitude high-frequency displays were, however, shown to have little effect on motion detection, even though high vection ratings were reported. R.R.

A88-46976
EYETRACKING WITH THE FIBER OPTIC HELMET MOUNTED DISPLAY
T. WILLIAMS (CAE Electronics, Ltd., Saint Laurent, Canada), M. KOMODA (Concordia University, Montreal, Canada), and J. ZEEVI (Technion - Israel Institute of Technology, Haifa) IN: 1987 Annual Summer Computer Simulation Conference, 19th, Montreal, Canada, July 27-30, 1987, Proceedings. San Diego, CA, Society for Computer Simulation, 1987, p. 730-734.

This paper describes a fiber-optic helmet-mounted display (FOHMD) which includes a high-resolution inset slaved to the user's point of gaze. The two primary components of the FOHMD that determine inset location are the eye position monitor and the postprocessor. The eye position monitor furnishes data describing

the instantaneous position of the eye, which include the error introduced by the nonlinearities in both the biological and optical systems. The postprocessor unit makes corrections for these errors. The paper includes equipment and algorithm diagrams. I.S.

A88-48706
FLIGHT-TRAINING METHODOLOGY [METODIKA LETNOGO OBUCHENIIA]
PETR VASIL'EVICH KARTAMYSHEV, ANATOLII IVANOVICH ORKIN, and MIKHAIL VLADIMIROVIC IGNATOVICH Moscow, Izdatel'stvo Transport, 1987, 280 p. In Russian. refs

Various aspects of flight-training methodology are elaborated. Particular attention is given to visual and instrument flight training, and to training for special situations. Principles for the analysis of the quality of training flight are described. B.J.

N88-26021# Bergen Univ. (Norway). Inst. of Physiological Psychology.
SELECTING THE RIGHT CREW FOR FUTURE SPACE STATIONS: AN ANALYSIS OF SELECTION RESEARCH ON OFFSHORE DIVERS, AVIATION PILOTS AND OTHER HIGH RISK GROUPS IN SCANDINAVIA
R. J. VAERNES, M. WARNCKE, T. BERGAN, and HOLGER URSIN *In* ESA, Proceedings of the Colloquium on Space and Sea p 47-51 Mar. 1988
Avail: NTIS HC A15/MF A01

Selection for high risk occupations, mainly pilots and offshore divers, using the Defense Mechanism Test (DMT) of Kragh (1960) is described. Longitudinal studies on serious nearmiss and fatal accidents (i.e., loss of aircraft); relationships to performance impairment in threatening situations; relationships to endocrine activation in threatening situations; and relationships to perceived health complaints and to physiological stress markers such as immunoglobuline levels are discussed, in view of selection criteria for manned space flights. Evidence shows that people with high defense strategies tend to have inadequate performance and high autonomic activation in threatening situations. Such subjects tend not to cope during training, and in the long term develop burn out problems. Multivariate analysis reveals three orthogonal (independent) endocrine factors with specific relations to psychological traits. A catecholamine factor relates to ambition and time urgency, and seems close to the Type A behavior described as being a cardiovascular risk. A cortisol factor relates to high defense mechanisms. The relation between an androgen and estrogen factor and personality is less stable. When an individual is faced with unsolved problems activation may become sustained and produce pathology through these personality-dependent endocrine reaction systems. It is shown that DMT level of prediction is many times greater than for other psychological tests which ignore the role of unconscious mental processes. ESA

N88-26026# Reims Univ., France. Lab. de Psychologie Appliquee.
SELECTION AND TRAINING OF SUBJECTS TO LIVE AND WORK IN HOSTILE AND UNUSUAL ENVIRONMENTS [SELECTION ET PREPARATION PSYCHOLOGIQUES DES SUJETS AYANT A VIVRE ET TRAVAILLER EN ENVIRONNEMENTS INHABITUELS ET HOSTILES]
JEAN RIVOLIER and G. CAZES *In* ESA, Proceedings of the Colloquium on Space and Sea p 87-89 Mar. 1988 In FRENCH
Avail: NTIS HC A15/MF A01

A psychological approach to the selection and training of persons having to work in stressful environments is outlined. The need for selection at group and individual level is underlined. Experience shows that while it is easy to weed out unsuitable individuals, it is much harder to forecast behavior in adapting to unusual and hostile conditions. The approach includes cognitive, pschophysiological, and biological parameters as well as traditional psychological tests. For group selection, role playing and T-groups are used, along with observation of problem solving. Behaviorist and cognitive techniques are used during training to reinforce positive potential and reduce weaknesses in subjects. ESA

N88-26028# Service de Sante des Armees, Dijon (France).
SELECTION OF ISOLATED SPACE CREWS [SELECTION DES PERSONNELS ISOLES DE L'ESPACE]
E. LEIGHTON *In* ESA, Proceedings of the Colloquium on Space and Sea p 95-98 Mar. 1988 In FRENCH
Avail: NTIS HC A15/MF A01

Experience of missions in isolated stations, of space candidate selection procedures, and in selecting flight personnel is combined to suggest a profile for space crew members and to derive selection criteria and tools. Qualities required for long duration space flight are reviewed. ESA

N88-26099# Naval Aerospace Medical Research Lab., Pensacola, Fla.
PREDICTING AIR COMBAT MANEUVERING (ACM) PERFORMANCE: FLEET FIGHTER ACM READINESS PROGRAM GRADES AS PERFORMANCE CRITERIA Interim Report, 1986 - 1987
G. R. GRIFFIN, T. R. MORRISON, T. L. AMERSON, and P. V. HAMILTON Oct. 1987 38 p
(AD-A191605; NAMRL-1333) Avail: NTIS HC A03/MF A01
CSCL 01B

A difficult aspect of predicting fleet pilot performance is acquiring meaningful and reliable, inflight criteria. Without such criteria, performance assessment is both theoretically and realistically impossible. This study was an attempt to predict Air Combat Maneuvering (ACM) performance using performance-based laboratory tests and to evaluate the VF-43 adversary squadron's grading of inflight ACM performance in the Fleet Fighter ACM Readiness Program at Naval Air Station Oceana. The purpose of the latter effort was to select convenient and reliable criteria for ACM performance assessment and use in the validation of the laboratory tests. In an initial evaluation (Study 1), F-4 pilots performed in Fleet Fighter ACM Readiness exercises and completed performance-based perceptual motor and multitask tests. Results indicated that dichotic listening test measures, obtained during multitask conditions, could be used to reliably predict ACM inflight criteria. Results of a larger sample of F-14 pilots (Study 2) indicated that an overall ACM grade (OAG) assigned by VF-43 adversary personnel can be predicted reliably by an objective kill difference composite score and three subjective measures: situational awareness, mutual support, and energy management. These four measures accounted for 78% of the variance with the OAG. A correlational analysis suggests that the VF-43 grading process is reliable and consistent. GRA

N88-26100# Brown Univ., Providence, R. I. Dept. of Physics.
GENERALIZATION AND THE BACKWARD PROPAGATION NEURAL NETWORK
CHARLES M. BACHMANN 14 Jan. 1988 10 p
(Contract DAAG29-84-K-0202)
(AD-A191634; ARO-22000.9-LS) Avail: NTIS HC A02/MF A01
CSCL 23C

The capacity of model neural networks to generalize from a partial set of information is an area of much current interest. It addresses the issue of how accurate current models are of higher cognitive processes; the ability to categorize input, to make generalizations based on a limited set of information, is one of the hallmarks of these processes. In this context, the author has been investigating the Backward Propagation of Error Model due to Rumelhart et. al. The model is a deterministic approach which seeks to teach a desired input-output mapping by repeated presentation of the desired mapping to the system, correcting the system connections based on the error in output. We have begun to address the generalization capability of this system. Specifically, we have studied to what extent the set of connections which evolve in learning a partial set of patterns are a general solution to a given mapping. That is, if we teach several examples of a mapping to the system, will the solutions that the system discovers for these patterns be capable of generalizing and correctly

identifying other input states that have not been seen. The results of some simulations undertaken to address this question are discussed and some modifications to the model which we have proposed are indicated. GRA

N88-26801# Pittsburgh Univ., Pa. Learning Research and Development Center.
INFERENCE AND DISCOVERY IN AN EXPLORATORY LABORATORY Technical Report, 1984 - 1987
VALERIE SHUTE, ROBERT GLASER, and KALYANI RAGHAVAN Feb. 1988 89 p
(Contract N00014-84-K-0542; RR0-4206)
(AD-A192231; UPITT/LRDC/ONR/KBC-10) Avail: NTIS HC A05/MF A01 CSCL 05H

This paper describes the results of a study done as part of a research program investigating the use of computer-based laboratories to support self-paced discovery learning in domains like microeconomics, electricity, and light refraction. Program objectives include maximizing the laboratories' effectiveness in helping students learn content knowledge, as well as identifying and coaching effective inference and discovery behaviors. This study with the microeconomics discovery laboratory demonstrates that computer-based laboratories can help students learn targeted concepts. In addition, the study identifies the inductive reasoning strategies used in the microeconomics discovery world by first-year university students, and compares the strategies of more and less successful learners. GRA

N88-26802# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
PLANS FOR DISCOURSE
BARBARA J. GROSZ and CANDACE L. SIDNER 1 Feb. 1988 35 p
(Contract N00014-85-C-0079)
(AD-A192242; BBN-6728) Avail: NTIS HC A03/MF A01 CSCL 05H

Discourses are fundamentally instances of collaboration behavior. We propose a model of the collaborative plans of agents achieving joint goals and illustrate the role of these plans in discourses. Three types of collaborative plans, called Shared Plans, are formulated for joint goals requiring simultaneous, conjoined or sequential actions on the part of the agents who participate in the plans and the discourse; a fourth type of Shared Plan is presented for the circumstance where two agents communicate, but only one acts. GRA

N88-26803# South Carolina Univ., Columbia. Dept. of Psychology.
WORKING MEMORY CAPACITY: AN INDIVIDUAL DIFFERENCES APPROACH Annual Technical Report, 1 Jan. 1987 - 1 Jan. 1988
RANDALL W. ENGLE 11 Feb. 1988 65 p
(Contract AF AFOSR-0069-87)
(AD-A192359; AFOSR-88-0265TR) Avail: NTIS HC A04/MF A01 CSCL 05H

Five experiments are described that study the relationship between measures of working memory and reading comprehension. Two experiments investigated whether the complex span measure must be similar to the reading comprehension task to be predictive of comprehension. The correlation found between reading comprehension and two reading-related complex spans was similar to those found between two arithmetic-related complex spans and comprehension. The relationship remained significant when quantitative skills were factored out. The simple digit and word spans (measured without a background task) did NOT correlate with reading comprehension. The complex span/comprehension correlations were a function of the difficulty of the background task. When the difficulty level of the reading-related or arithmetic-related background tasks was moderate, the span/comprehension correlations were higher in magnitude than when the background tasks were simple or very difficult. The third experiment showed that if serial recall was required in the span tasks, simple word span did significantly predict reading comprehension but not as well as the sentence span. The fourth experiment showed that the ordering of list lengths in the span tasks had little influence on the correlation between span scores and comprehension. The fifth experiment is the first in a series investigating variables whether variables that influence simple word span also influence the sentence word span. GRA

N88-26804# Air Command and Staff Coll., Maxwell AFB, Ala.
USAF FLYING SCREENING: FIRST STEP ON THE ROAD TO WINGS
STEFAN EISEN, JR. Apr. 1988 49 p
(AD-A192613; ACSC-88-0850) Avail: NTIS HC A03/MF A01 CSCL 05I

The current high attrition rate in USAF pilot training is partly due to high potential eliminees entering the training system. This study examines the flight screening programs of West Germany, Great Britain, Canada, Israel, and the US Navy, and makes observations on significant features in each of the programs. Recommendations are made based on lifting the best features from each program and integrating them into the current USAF flying screening program. By improving the screening process, fewer high potential eliminees will enter the USAF pilot training system, leading to a lower attrition rate. GRA

N88-26805# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Psychology.
THE ROLE OF WORKING MEMORY IN LANGUAGE COMPREHENSION
PATRICIA A. CARPENTER and MARCEL A. JUST Feb. 1988 33 p
(Contract N00014-85-K-0584; RR0-4206)
(AD-A192721; ONR-88-1) Avail: NTIS HC A03/MF A01 CSCL 05H

This chapter provides an account of the transient computational and storage demands that typically arise during comprehension, and of the information management policies that attempt to satisfy those demands. The chapter describes a number of recent studies that examine the trading relation between computation and storage in working memory during language comprehension. Comprehension processes tend to minimize storage requirements by minimizing the number of partial products that have to be stored. The minimization is accomplished by immediately digesting as much of the information from the text as possible (what we have called the immediacy of processing), rather than using a wait-and-see strategy. A second focus is on the differences among individuals in their ability to maintain information in working memory during comprehension. Such individual differences in working memory capacity are closely related to large and stable individual differences in reading comprehension ability. GRA

N88-26806# Centre d'Etudes et de Recherches de Medecine Aerospatiale, Paris (France). Div. de Psychophysiologie de la Perception Visuelle.
PRELIMINARY STUDY WITHIN A PROJECT FOR THE DEVELOPMENT OF INTELLIGENT ASSISTANCE TO PILOTING: FORMAL DESCRIPTION OF COMBAT PILOT EXPERTISE AND IMPLEMENTATION OF AN INTERACTIVE SYSTEM TO REPRESENT OPERATIONS [ETUDE PRELIMINAIRE DANS LE CADRE DU DEVELOPPEMENT D'AIDES INTELLIGENTES AU PILOTAGE: FORMALISATION DE L'EXPERTISE D'UN PILOTE DE COMBAT ET MAQUETTAGE D'UN SYSTEME INTERACTIF DE REPRESENTATIONS OPERATIONNELLES]
R. AMALBERTI, C. VALOT, and J.-P. MENU Dec. 1987 143 p In FRENCH
(Contract DRET-86-1021)
(CERMA-87-31; ETN-88-92543) Avail: NTIS HC A07/MF A01

In order to explore the mental functions of combat pilots a psychological analysis was performed including a thorough questioning leading to the implementation of general laws describing the organization of knowledge and behavior in real combat situations. The implementation of a computer aid system

for the flight phase confirms that a simplified display has a negative effect since it affects the pilot's trust in system capacities. ESA

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MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

A88-46205
ANTI-G TROUSERS - DESIGN AND MANUFACTURE
J. M. HAWKINS (Beaufort Air-Sea Equipment, Ltd., Birkenhead, England) IN: High G and high G protection - Aeromedical and operational aspects; Proceedings of the Symposium, London, England, Oct. 21, 1987. London, Royal Aeronautical Society, 1987, p. 26-32.

The advanced anti-G trousers whose development and performance is presently discussed incorporates a simple, low bulk valve system which is built inside the inflatable bladder that is the basis of the trousers' operation under G-loading. The trousers furnish an upward direction of inflation, in order to counteract the downward flow of the subjects' blood. An account is given of the simplified method used to manufacture the garment. O.C.

A88-46206
ANTI-G VALVES FOR FUTURE COMBAT AIRCRAFT
STUART LAMB (Hymatic Engineering Co., Ltd., Redditch, England) IN: High G and high G protection - Aeromedical and operational aspects; Proceedings of the Symposium, London, England, Oct. 21, 1987. London, Royal Aeronautical Society, 1987, p. 33-40.

The main valve/servo valve systems and electronic anti-G valve systems have been developed to meet RAF requirements for a G-suit fill rate sufficiently high to counteract G-onset rates in excess of 10 G/sec. The operation of these valves may be on the basis of either engine-bleed air or breathing gas supplies, and there will be an interface with a breathing gas regulator to furnish positive breathing pressure under high-G conditions. The electronic valve can function on the basis of either externally furnished signals or internal acceleration sensor signals. O.C.

A88-46207
G VALVES AND G SENSITIVE BREATHING REGULATORS
R. CASSIDY and B. M. BREWER (Normalair-Garrett, Ltd., Yeovil, England) IN: High G and high G protection - Aeromedical and operational aspects; Proceedings of the Symposium, London, England, Oct. 21, 1987. London, Royal Aeronautical Society, 1987, p. 41-47.

The G-level-regulated aircrew breathing devices presented were developed in response to an RAF requirement for an oxygen regulator with integral G-sensitive, positive pressure-regulating modules. The devices, whose mechanical design features and operational function details are presented, are based on the Harrier GR5 VTOL fighter's oxygen regulator, into which a G-module can be fitted without major modifications. O.C.

A88-46264
HUMAN FACTORS OF HELICOPTER VIBRATION. III - ASSESSMENT OF VIBRATION EXPOSURE
MICHAEL J. GRIFFIN (Southampton, University, England) IN: Helicopter vibration and its reduction; Proceedings of the Symposium, London, England, Nov. 16, 1987. London, Royal Aeronautical Society, 1987, p. 50-69. refs

This paper illustrates a method of assessing helicopter vibration with respect to human response. Representative vibration spectra in the fore-and-aft, lateral, and vertical directions on the pilot's seat, at the seat back, and on the floor are shown. Methods of quantifying the vibration in these nine axes with respect to comfort, health, and performance are defined. It is shown that the vibration varies in magnitude during a flight, and varies between aircraft of the same type. The effect of the seat on the transmission of vibration to the pilot is quantified. Methods of reducing the effects of helicopter vibration are considered. Author

A88-46982
SIMULATION OF SPACE MANIPULATOR OPERATIONS (EUROSIM)
C. N. A. PRONK (Nationaal Lucht- en Ruimtevaartlaboratorium, Amsterdam, Netherlands), A. ELFVING (ESA, Noordwijk, Netherlands), E. ERSUE (ISRA Systemtechnik GmbH, Darmstadt, Federal Republic of Germany), and A. L. LIPPAY (CAE Electronics, Ltd., Montreal, Canada) IN: 1987 Annual Summer Computer Simulation Conference, 19th, Montreal, Canada, July 27-30, 1987, Proceedings. San Diego, CA, Society for Computer Simulation, 1987, p. 845-850. refs
(Contract ESA-6482/85)

The requirements for the simulation software of a European robotics operations simulator (Eurosim) are outlined and discussed. Eurosim has to cover a wide range of applications including general research and development; design; development; testing, verification, and qualification; training of human operators; and operations planning support. In an early stage of definition of Eurosim, four main functional subsystems were identified: the simulation subsystem, the image generation subsystem, the real-word operations subsystem, and the supervision subsystem. It is suggested that standards in software development be used, such as modularity, calling standards, and high-level languages to minimize maintenance costs. K.K.

A88-47226
AN ALTERNATIVE APPROACH TO HIGH G PROTECTION
R. E. VAN PATTEN (USAF, Harry G. Armstrong Aerospace Medical Research Laboratory, Wright-Patterson AFB, OH) SAFE Journal, vol. 18, Summer Quarter 1988, p. 8-10.

This paper discusses the conventional approaches to the enhancement of acceleration protection in terms of cost/complexity/benefits in the context of the requirements for current first line fighter aircraft and the likely demands of the future generations of such aircraft. These approaches are then compared to the known deficiencies in protection existing in current fighter operations. A proposal is advanced for a radical departure from current approaches to acceleration protection. This alternative approach is based upon existing knowledge of the physiology of human tolerance to sustained acceleration and, in particular, the concept of the brain blood oxygen reserve. The potential for markedly enhancing fighter performance through the use of advanced flight control system law algorithms is detailed, and the required basic research program necessary to reach that objective is outlined. Author

A88-47227
A COMPARISON OF UNIFORM PRESSURE ANTI-G SUITS
ROBERT W. KRUTZ, JR., A. G. KRUEGER (Krug International Corp., Technology Services Div., San Antonio, TX), and R. R. BURTON (USAF, School of Aerospace Medicine, Brooks AFB, TX) SAFE Journal, vol. 18, Summer Quarter 1988, p. 14-18. USAF-supported research.

A study was carried out to compare the G-protection afforded by the standard anti-G suit, the reticulated foam suit, and the most current pneumatic uniform pressure suit. G-tolerance enhancement was evaluated by using standard visual decrement criteria, impedance plethsymography to measure blood pooling, and standard lactate levels to determine the degree of muscular straining during simulated air-combat maneuvers on the USAF School of Aerospace Medicine centrifuge. It is shown that the pneumatic uniform pressure suit, with its increased coverage, mobility, increased G-tolerance and endurance, provides significant advances in anti-G suit state-of-the-art. K.K.

A88-47228
ANTI-G VALVES - WHEN IS FAST, TOO FAST?
MIKE RATAJCZAK (Carleton Technologies, Inc., East Aurora, NY)

SAFE Journal, vol. 18, Summer Quarter 1988, p. 19-23. refs

The flight testing of a rapid response electronic anti-g valve using an F-16B model aircraft is described. Various high g test points as well as simulated aerial combat maneuvers were performed. The valve characteristics which initially caused comfort problems are discussed. It is believed that the g valve should respond to the acceleration profile without lag during rapid onsets of acceleration and provide smooth operation in the fluctuating low g environment. The data confirm that fast acting valves offer increased protection. K.K.

A88-47229
AN ENGINEERING TEST AND EVALUATION OF SEVERAL NEW ANTI-G VALVES

LARRY J. MEEKER (USAF, School of Aerospace Medicine, Brooks AFB,TX), A. G. KRUEGER, and PAUL E. LOVE (Krug International Corp., San Antonio, TX) SAFE Journal, vol. 18, Summer Quarter 1988, p. 24-27. refs

Comparisons were made between the French EROS, MOOG/Carleton, and Garret fluidic anti-G valves (AGVs) on the basis of evaluations accomplished on the USAF School of Aerospace Medicine centrifuge. Specially designed low-stretch bladders capable of simulating different G-suit volumes were used. Valves were tested in 17 different combinations of valve angle with G-vector, source pressure, G-onset rate, and G-suit volume. The data are presented graphically indicating G-level versus flow, pressure, and G-onset rate. It is concluded that all of these valves are very high performance AGVs; they are capable of exceeding the anti-G suit pressure requirements during very high Gz onset maneuvers. K.K.

A88-47230
DATA ACQUISITION AND DIGITAL RECORDING DEVICE FOR IMPACT TEST

J. M. CLERE, J. L. POIRIER, D. LEBRUN, and K. SMEAD (Centre d'Essais en Vol, Bretigny-sur-Orge, France) SAFE Journal, vol. 18, Summer Quarter 1988, p. 36-41. refs

The current method of ejection seat and crashworthiness testing employs two kinds of data transmission systems (wire and FM telemetry). Although these devices have proven their efficacy, they cannot be employed in several specific situations. The system presented is an advanced digital recorder which was designed for the Boeing 720 crash test (December 1984) to record acceleration levels from a manikin. It is designed to be wholly self-contained, operate in very stressful environments (high temperature and G levels), and introduce no interference into other simultaneously operating data systems. This recorder has the following characteristics: 9 inputs, over 200 Hz sampling capability, recording time: 6.4 s on RAM, automatic trigger, self-contained power supply, electrical converters for system integration, fire and shock proof packaging, low cost. In the initial experiment, the recorder is co-located with a manikin on a seat manufactured by SICMA (figure 1). Data are transferred to a microcomputer for analysis. Proof tests permitted evaluation of its function under high G acceleration and thermal stress. Author

A88-47338* ST Systems Corp., Lanham, Md.
COOPERATIVE CONTROL OF TWO ARMS IN THE TRANSPORT OF AN INERTIAL LOAD IN ZERO GRAVITY

CRAIG R. CARIGNAN (ST Systems Corp., Lanham, MD) and DAVID L. AKIN (MIT, Cambridge, MA) IEEE Journal of Robotics and Automation (ISSN 0882-4967), vol. 4, Aug. 1988, p. 414-419. refs

(Contract NAGW-21)

In designing a robot control system for dual arm configurations, the control engineer is faced with two challenges: to derive the equations of motion for a given situation, and to meet certain desired control requirements (for instance, minimum energy). The former may involve closed kinematic chains, such as the case when the two arms are grasping a common object. The latter usually involves nonlinear optimization. These issues are considered in the context of transporting an inertial load using two planar three-link arms. A generalized 'reduction transformation' is applied to the dynamics to remove the singularity in the system equations. A suboptimal minimum energy method is presented to reduce a difficult 12-state, six-control nonlinear optimization to two independent, nonconflicting suboptimizations. A simulation example is provided to illustrate the degree of energy reduction possible using the optimal arm torque distribution that was developed. I.E.

A88-48628
THERMAL ANALYSIS OF HUMAN BODY-CLOTHING-ENVIRONMENT SYSTEM

L. IMRE, A. BITAI, C. D. HORVATH (Budapesti Muszaki Egyetem, Budapest, Hungary), L. BANHIDI (Scientific Institute for Building, Budapest, Hungary), and Z. PAMMER (Cooperative REALCO, Budapest, Hungary) International Journal for Numerical Methods in Engineering (ISSN 0029-5981), vol. 25, June 1988, p. 357-371. Research supported by the Ministry of Building and City Development of Hungary. refs

A thermal model of the clothed human body is developed analytically using boundary conditions of the third kind. The body is discretized into 16 components, connected by arteries and veins and with different physiologically determined thermal characteristics; the clothing is modeled as a system of layers, separately for each of the body components. The derivation of the model equations is outlined, and the time-stepping numerical implementation of the model is explained in detail and illustrated with a flow chart. Results (consisting of skin-temperature histories for naked and clothed 18- and 38-year-old men under different environmental conditions) are compared with published experimental data in graphs. T.K.

A88-48726
MEANS OF MAINTAINING THE WORK CAPACITY OF HUMANS USING INDIVIDUAL PROTECTIVE FACILITIES [PUTI SOKHRANENIIA RABOTOSPOSOBNOSTI LIUDEI, NAKHODIASHCHIKHSIA V SREDSTVAKH INDIVIDUAL'NOI ZASHCHITY]

IU. G. PLETENSKII, P. B. MARKELOV, A. IU. NEFEDOV, and M. I. KHARCHENKO Voenno-Meditsinskii Zhurnal (ISSN 0026-9050), May 1988, p. 45-47. In Russian. refs

This paper considers methods for maintaining the work capacity of humans wearing protective suits (designed as a safeguard against radioactive or chemical substances), alone or in combination with ventilation and/or artificial skin-wetting systems. Both of these artificial thermoregulatory systems were demonstrated to be effective in an elevated-temperature environment. However, the nonautonomous character of these systems limits their applicability under normal-gravity on-ground conditions. The regulation of work-rest sequences is, at present, the most accessible method for the prevention of hyperthermia inside protective suits and for the maintenance of work capacity. I.S.

A88-49146
EVALUATION OF HUMAN FACTORS IN AIRBUS PILOT COCKPIT CERTIFICATION [L'APPRECIATION DES FACTEURS HUMAINS DANS LA CERTIFICATION DES POSTES DE PILOTAGE DE L'AIRBUS]

JEAN-JACQUES SPEYER (Airbus Industrie, Blagnac, France) L'Aeronautique et l'Astronautique (ISSN 0001-9275), no. 130, 1988, p. 43-50. In French.

The evolution of the Airbus pilot cockpit from the A300FF to the A310 to the A320 is discussed, and means of certifying these systems and characterizing their man-machine interfaces are considered. The static analysis method, a quantitative analysis of the system tasks of the third crewmember, makes it possible to balance the workload of the two pilots. The dynamic method is a qualitative technique for evaluating the workload resulting from the interaction of all of the cockpit and flight management functions, with each pilot's workload being determined according to a scale derived from the Cooper-Harper scale. The performance criteria

method is used to evaluate the impact of new technologies such as EFISs, the flight management system, and the electric flight control system on the A310 and A320 cockpits. R.R.

N88-26017# Direction des Constructions et Armes Navales, Toulon (France). Centre d'Etudes et de Recherches Techniques Sous-Marines.

PHYSIOLOGICAL EFFECTS ON MAN OF LONG DURATION CONFINEMENT IN A CARBON DIOXIDE ENRICHED ENVIRONMENT [EFFETS PHYSIOLOGIQUES CHEZ L'HOMME DU CONFINEMENT DE LONGUE DUREE EN ATMOSPHERE ENRICHIE EN DIOXYDE DE CARBONE]

EUGENE RADZISZEWSKI, L. GIACOMONI, and R. GUILLERM *In* ESA, Proceedings of the Colloquium on Space and Sea p 19-23 Mar. 1988 In FRENCH

(Contract DRET-79-1098)

Avail: NTIS HC A15/MF A01

Eleven experiments of 6 to 46 days duration were performed on a total of 58 subjects in a climate chamber whose atmosphere was enriched at different partial pressures with carbon dioxide (PI-CO2 0.48 to 4.28 kPa, i.e., a concentration of 0.5 to 4.5 percent at a chamber pressure of 100 kPa). In a 46 day control experiment, the PI-CO2 was near 0, to evaluate the amplitude of effects linked to life in an enclosed space, to separate these effects from those purely due to CO2. Measurements conducted included analysis of breathed gases, acid-base equilibrium of the blood, hydromineral equilibrium, hematology, biorhythms, and psychmotor performance. Results reveal adaptation mechanisms of man to prolonged confinement and breathing involving different partial pressures of the CO2 intake, and enable acceptable limits of CO2 for enclosed spaces to be established. ESA

N88-26023# Centre d'Essais en Vol, Bretigny-Air (France). Lab. de Medecine Aerospatiale.

SPACE CABIN ATMOSPHERE AND EXTRACURRICULAR SORTIE [ATMOSPHERE D'UNE CABINE SPATIALE ET SORTIE EXTRA-VEHICULAIRE]

HENRI MAROTTE and MARC WEIBEL (Avions Marcel Dassault-Breguet Aviation, Saint-Cloud, France) *In* ESA, Proceedings of the Colloquium on Space and Sea p 69-76 Mar. 1988 In FRENCH

Avail: NTIS HC A15/MF A01

Conditions which provoke aeroembolism were studied to help design space suits which reduce risks entailed in passing from the terrestrial like conditions of a spacecraft cabin atmosphere to the medium and low pressures of space suits. Design constraints on the suite and its pressurizing system were evaluated, especially for the working conditions of space stations, which require frequent extravehicular activity. Given the limits imposed by denitrogenation, a high pressure (at least 650 hPa) is suggested for the American space station program, whereas for ESA, use of Hermes is compatible with a 450 hPa suit. For intravehicular emergency suits, pressure should be as high as compatible with mobility requirements (bearing in mind the reduced level of physical activity). ESA

N88-26024# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).

TECHNICAL CHALLENGES IN THE DEVELOPMENT OF A EUROPEAN SPACE SUIT SYSTEM AND COMPARISON WITH UNDERWATER SUITS

D. ISAKEIT *In* ESA, Proceedings of the Colloquium on Space and Sea p 77-82 Mar. 1988

Avail: NTIS HC A15/MF A01

The key issues and the technical problems in the development of a European space suit system for extravehicular activity in the areas of crew enclosure, life support, information, and operations are compared to the problems associated with underwater suits. For design engineers of the space and the sea community, areas of common interest are reviewed in order to identify possible fields of cooperation. ESA

N88-26027# Norges Tekniske Hoegskole, Trondheim. Div. of Medical Technology.

SIMILARITIES BETWEEN DIVING OPERATIONS AND SPACE MISSIONS

GRETA BOLSTAD *In* ESA, Proceedings of the Colloquium on Space and Sea p 91-94 Mar. 1988

Avail: NTIS HC A15/MF A01

Similarities and commonalities between saturation diving and space missions, based on experience from diving and limited to human factors engineering are reviewed. Areas where European diving and space research institutions and industry may contribute to or benefit from each others experience and knowhow by working closer together are suggested. ESA

N88-26030# Institut Francais de Recherche pour l'Exploitation de la Mer, La Seyne sur Mer.

DIFFERENT TECHNIQUES FOR INTERVENING UNDER THE SEA: POSSIBLE LINKS WITH SPACE APPLICATIONS [LES DIFFERENTES TECHNIQUES D'INTERVENTION SOUS LA MER - LEURS LIENS POSSIBLES AVEC LE DOMAINE SPATIAL]

B. GRANDVAUX *In* ESA, Proceedings of the Colloquium on Space and Sea p 109-113 Mar. 1988 In FRENCH

Avail: NTIS HC A15/MF A01

Diving techniques ranging from those using no equipment to sophisticated underwater habitats, vehicles, and robots are reviewed. Operations conducted underwater, including observations and manipulations by men and machines are outlined. Similarities with the space environment are considered, and the possibility of transferring knowhow and technology is discussed. ESA

N88-26032# Institut Francais de Recherche pour l'Exploitation de la Mer, La Seyne sur Mer.

ERGONOMY AND INTERIOR FURNISHING OF THE CABINS OF DEEP DIVING MANNED SUBMARINES: THE NAUTILE EXAMPLE [ERGONOMIE ET AMENAGEMENTS INTERIEURS DES HABITACLES DES SOUS-MARINS HABITES GRANDE PROFONDEUR. EXAMPLE: LE NAUTILE]

J. F. DROGOU, L. GIACOMONI, and EUGENE RADZISZEWSKI *In* ESA, Proceedings of the Colloquium on Space and Sea p 121-123 Mar. 1988 In FRENCH

Avail: NTIS HC A15/MF A01

Human factors engineering considerations in the design of the interior of a research submarine for great depths, particularly posture of the pilot at his workstation, are discussed. The pilot lies on a couch during the three types of task he accomplishes: steering the craft through the water, guiding it along the sea bed and instrument observation, and direct intervention using remote manipulators. A couch with joints at three places was derived: cervico-cephalic, thoraco-abdominal (hip level), and leg-thigh (knee level). Stresses induced by the working position were analyzed by measuring heart rate, breathing difficulty, and local blood circulation. Results show that heart rate increases by 10%, which is no more than normally found when going from a laying to a sitting position; slight but acceptable breathing difficulty; no circulation problems; no uncomfortable or painful situations, but a need to change position frequently. ESA

N88-26033# Bell and Trotti, Inc., Houston, Tex.

HABITABILITY OF THE SPACE STATION: FROM VEHICLE TO LIVING SPACE [HABITABILITE DE LA STATION SPATIALE. DU VEHICULE AU LIEU DE VIE]

FRANCIS WINISDOERFFER *In* ESA, Proceedings of the Colloquium on Space and Sea p 125-134 Mar. 1988 In FRENCH

Avail: NTIS HC A15/MF A01

Constraints, design rules, and requirements influencing the interior design of the Space Station inhabited module are reviewed. Main constraints on the envelope are the dimensions of the shuttle cargo bay and gravitational effects at the different flight phases. The interior is based on the four standoff configuration, consisting of a free space inside a tube formed by four standard double racks. The manned module has a galley, a central area for meals, teleconferences, and recreation equipped with tables, medical unit,

hygiene equipment, command post, and individual cabins. Orientation in microgravity is helped by the choice of lighting and colors, which mimic patterns found on Earth, i.e., darker colors towards the floor. Human factors which must be allowed for include noise, eating (habits and taste), smells, exercice, and free time (passive recreations such as reading or looking at the Earth are favored by crews). ESA

N88-26034# Compagnie Maritime d'Expertises, Marseille (France).
THE SAGA HIGHLY AUTONOMOUS ASSISTANCE SUBMARINE [SAGA: SOUS-MARIN D'ASSISTANCE A GRANDE AUTONOMIE]
JEAN MOLLARD and B. GRANDVAUX (Institut Francais de Recherche pour l'Exploitation de la Mer, La Seyne sur Mer.) *In* ESA, Proceedings of the Colloquium on Space and Sea p 135-138 Mar. 1988 In FRENCH
Avail: NTIS HC A15/MF A01

A 28 m, 550 T industrial submarine was built for diver support. It consists of a pressurized cabin for six crewmembers plus a hyperbaric habitat for 4 to 6 divers capable of leaving the craft to work on sites up to 460 m depth, connected by umbilical cords. Underwater range is 150 nautical miles, and the submarine can return to its base without surfacing, for missions of over a week. Maximum depth is 600 m. The submarine can support diving in any weather conditions, even under ice. Cruising speed is 4 kts for 300 nautical miles. Energy is produced by a Stirling engine. Oxygen is stored at cyrogenic temperatures and gas is stored at 400 bar in bottles. A high degree of computerization of command and control functions allows crew numbers to be reduced. ESA

N88-26036# Norges Tekniske Hoegskole, Trondheim. Div. of Medical Technology.
MONITORING OF DIVERS/ASTRONAUTS DURING MISSIONS
BARD HOLAND and GRETA BOLSTAD *In* ESA, Proceedings of the Colloquium on Space and Sea p 149-153 Mar. 1988
Avail: NTIS HC A15/MF A01

It is shown how operational monitoring of divers during deep dive missions is based on experience from onshore simulated dives. Based on extensive monitoring during simulated dives, correlations between human responses and equipment performance are recorded and used to eliminate the need for physiological monitoring during operational dives. Similarities between the requirements for operational monitoring of divers and astronauts are described. ESA

N88-26038# Avions Marcel Dassault-Breguet Aviation, Saint-Cloud (France).
SAFETY OF EXTRAVEHICULAR SPACE ACTIVITIES [SECURITE DES ACTIVITES SPATIALES EXTRA-VEHICULAIRES]
JACQUES LALOE *In* ESA, Proceedings of the Colloquium on Space and Sea p 161-168 Mar. 1988 In FRENCH
Avail: NTIS HC A15/MF A01

Factors which influence safety in space missions requiring extravehicular activity (EVA) are recalled. Research and development in EVA techniques are discussed. Life support systems; movement, mobility, and dexterity; interfaces; and crew procedures are considered. ESA

N88-26039# Southern California Inst. of Architecture, Santa Monica. Space Projects Group.
RECENT RESEARCH ON CREW WARDROOM HABITABILITY FOR THE SPACE STATION
D. NIXON, REGIS FAUQUET, and T. TAYLOR *In* ESA, Proceedings of the Colloquium on Space and Sea p 169-173 Mar. 1988
Avail: NTIS HC A15/MF A01

The design of the crew Wardroom for the U.S./International Space Station, required to support a maximum eight-person Space Station crew for periods as long as 6 months is discussed. Research techniques involve the construction and evaluation of a simulated Wardroom with meeting, meal, galley, exercise, and workstation facilities. The research shows that much opportunity exists to improve the design of crew accommodation and facilities beyond the standards accepted or specified for initial Space Station application. Successive future Space Station crews can benefit by greater attention to good facilities and equipment design. The introduction of appropriate innovative architectural and industrial design features can help to achieve and sustain optimum operational efficiency and enhanced environmental habitability throughout the Space Station life-cycle. ESA

N88-26040# Institut Francais de Recherche pour l'Exploitation de la Mer, La Seyne sur Mer.
UNDERWATER SIMULATION FOR SPACE TELEOPERATION
J.-L. MICHEL and J.-F. DROGOU *In* ESA, Proceedings of the Colloquium on Space and Sea p 175-176 Mar. 1988
Avail: NTIS HC A15/MF A01

The use of water to simulate on land the conditions of microgravity encountered in space is reviewed. Neutral buoyancy is achieved underwater on submersibles and remotely operated vehicles but space simulation imposes specifically that the neutral buoyancy has also to be realized particularly on movable parts as telemanipulators. The physical properties of water limits the validity of the simulation to movements with very extremely low speed. Two vehicles realized for NASA are used to simulate vehicle mobility in docking phase and assembling teleoperations in water tanks. Knowing limitations and constraints, simulation in water offers the possibility to evaluate the relative efficiency of operations involving man and teleoperation on complex tasks. ESA

N88-26041# Norwegian Marine Technology Research Inst., Trondheim.
MARINTEK'S OCEAN BASIN, A TRAINING FACILITY FOR EXTRAVEHICULAR ACTIVITY?
TOR EINER BERG *In* ESA, Proceedings of the Colloquium on Space and Sea p 177-182 Mar. 1988
Avail: NTIS HC A15/MF A01

Equipment and functional requirements for a neutral buoyancy facility for weightlessness simulation are discussed. Time schedule and costs related to modification and upgrading of an ocean basin to become an extravehicular activity training facility for ESA are estimated. ESA

N88-26042# Bureau Veritas, Courbevoie (France).
REDUCING RISKS INHERENT IN OPERATING UNDERWATER CRAFT: THE CONTRIBUTION OF CLASSIFICATION, THE EXAMPLE OF THE SAGA HIGHLY AUTONOMOUS SUPPORT SUBMARINE [REDUIRE LES RISQUES INHERENTS A L'OPERATION DES ENGINS SOUS-MARINS: L'APPORT DE LA CLASSIFICATION, L'EXEMPLE DU SAGA]
D. BERDIN *In* ESA, Proceedings of the Colloquium on Space and Sea p 183-189 Mar. 1988 In FRENCH
Avail: NTIS HC A15/MF A01

Risks which submarines encounter during operation are reviewed. The importance of the classification attributed by organizations such as the Bureau Veritas to submarines is stressed. Regulations which such bodies impose to reduce risks are discussed. Risk analyses and the risk reduction strategy employed in the SAGA industrial submarine are described. ESA

N88-26043# CGR MeV, Buc (France).
SPACE AND SEA: IS THERE A PLACE FOR IONIZATION? [ESPACE ET MER: L'IONISATION AURA-T-ELLE SA PLACE?]
T. SADAT and C. CUILLANDRE *In* ESA, Proceedings of the Colloquium on Space and Sea p 191-192 Mar. 1988 In FRENCH
Avail: NTIS HC A15/MF A01

The ionization of food products for use by divers and space crews is suggested. The ionization of urban wastes discharged into the sea is suggested. The use of ionization in desalinization of sea water is proposed. ESA

N88-26044# Centre National d'Etudes Spatiales, Toulouse (France).
TASKS FORESEEN FOR SPACE ROBOTS AND AN EXAMPLE OF AN ASSOCIATED ORBITAL INFRASTRUCTURE [TACHES ENVISAGEES POUR LES ROBOTS SPATIAUX ET EXEMPLE D'INFRASTRUCTURE ORBITAL ASSOCIEE]
PIERRE DUTTO *In* ESA, Proceedings of the Colloquium on Space and Sea p 199-208 Mar. 1988 In FRENCH
Avail: NTIS HC A15/MF A01

Robot activities on manned space stations are discussed and permanent installation of robots on automatic space platforms is considered. Robot interventions in dangerous areas such as spaceborne nuclear reactors and platforms subjected to high doses of radiation are treated. Robots on deep space probes are assessed. The actual and envisaged orbital infrastructures of the NASA, USSR, and European space programs are reviewed. ESA

N88-26045# European Space Agency. European Space Research and Technology Center, ESTEC, Noordwijk (Netherlands).
MAN VERSUS MACHINE: THE ROLE OF ASTRONAUTS IN EXTRAVEHICULAR ACTIVITY
E. OLIER *In its* Proceedings of the Colloquium on Space and Sea p 213-218 Mar. 1988
Avail: NTIS HC A15/MF A01

Extravehicular acitivity (EVA) in NASA and USSR space programs is reviewed and European needs, particularly for the Columbus and Hermes programs, are assessed. It is suggested that remote manipulators and EVA are complementary, although EVA offers advantages once the work site is reached. ESA

N88-26046# MATRA Espace, Paris-Velizy (France).
COMPUTER AIDED REMOTE CONTROL: A GENERAL CONCEPT FOR INTERVENTION IN THE NUCLEAR, UNDERWATER, AND SPACE DOMAINS [TAO: TELEOPERATION ASSISTEE PAR ORDINATEUR. UN CONCEPT GENERIQUE POUR L'INTERVENTION EN MILIEU NUCLEAIRE, SOUS-MARIN OU SPATIAL]
GUY ANDRE and RAYMOND FOURNIER (Commissariat a l'Energie Atomique, Fontenay-aux-Roses, France) *In* ESA, Proceedings of the Colloquium on Space and Sea p 221-231 Mar. 1988 In FRENCH
Avail: NTIS HC A15/MF A01

Research and development in remote operation robotics are reviewed, especially flexibility, adaptability, autonomy, and system observability. An architecture for computer aided remote operation is presented. Problems associated with the main subsystems are considered: generalized bilateral control; information feedback; programming; and supervision. An integrated test site and ergonomic factors in its design are described. Applications to space, oceanographic, and nuclear domains are suggested. ESA

N88-26047# Ifremer, Paris (France).
MARINE TECHNIQUES: R AND D AXES, IDENTIFICATION OF AREAS OF COMMON INTEREST WITH SPACE TECHNIQUES [TECHNIQUES MARINES: AXES DE R ET D. IDENTIFICATION DE DOMAINES D'INTERET COMMUN AVEC LES TECHNIQUES SPATIALES]
FABRICE THEOBALD *In* ESA, Proceedings of the Colloquium on Space and Sea p 233-234 Mar. 1988 In FRENCH
Avail: NTIS HC A15/MF A01

The evolution of space and underwater technologies is reviewed and areas of cooperation are identified. These include positioning in three dimensions, remote manipulation, life in a confined space, mapping, systems reliability, and test and qualification procedures. ESA

N88-26048# Institut Francais de Recherche pour l'Exploitation de la Mer, La Seyne sur Mer.
ELIT: AN AUTONOMOUS UNDERWATER OBSERVATION ROBOT [ELIT: UN ROBOT SOUS-MARIN D'OBSERVATION AUTONOME]
P. BOROT and L. BRISSET *In* ESA, Proceedings of the Colloquium on Space and Sea p 235-241 Mar. 1988 In FRENCH
Avail: NTIS HC A15/MF A01

The ELIT manned submersible for dives down to 1000 m is introduced. The ELIT is controlled from the surface without an umbilical cord, using acoustics. Design constraints on the control system induced by the low bit rates and considerable delays inherent in acoustic transmission underwater are discussed. The onboard systems derived to overcome these problems are described. The guidance, picture transmission, and measuring systems are outlined. The craft is designed for dives lasting 3 to 4 hr in a 0.5 m/sec current, with a maximum speed of 1 m/sec. ESA

N88-26049# Societe Generale de Construction Electriques et Mechaniques Alsthom, Nantes (France). Etablissement ACB Energie.
UNDERWATER ROBOTICS IN THE SERVICE OF OIL FIELD EXPLOITATION: THE RUNNING AND INTERCONNECTING TOOL (RIT) IN THE EAST FRIGG FIELD (NORTH SEA) [LA ROBOTIQUE SOUS-MARINE AU SERVICE DE L'EXPLOITATION PETROLIERE: L'ENGIN RIT SUR LE CHAMP DE FRIGG-EST]
J. CHEREAU *In* ESA, Proceedings of the Colloquium on Space and Sea p 243-246 Mar. 1988 In FRENCH
Avail: NTIS HC A15/MF A01

The Running and Interconnecting Tool (RIT) was developed for the installation of modules of an underwater gas production station without using divers. The RIT consists of a module maintenance structure; a crane for maintenance of the multiconnectors and protective coverings; a video system; an electrohydraulic umbilical line; a control cabin and hydraulics cabin on the surface; and an electrohydraulic control system. The RIT is designed to operate during the entire 14 yr life of the field, for 15 day periods 2 or 3 times a year. ESA

N88-26052# Aeroformation Blagnac (France).
DEVELOPMENT OF TRAINING IMPLYING MAN-MACHINE INTERFACE: FROM THE AIRCRAFT TO THE SPACECRAFT [DEVELOPPEMENT DE FORMATION IMPLIQUANT L'INTERFACE HOMME-MACHINE: DE L'AVION AU VAISSEAU SPATIAL]
JEAN-FRANCOIS SCHMIDT *In* ESA, Proceedings of the Colloquium on Space and Sea p 257-259 Mar. 1988 In FRENCH
Avail: NTIS HC A15/MF A01

Developments in crew training for aircraft are reviewed and the contribution of audiovisual training aids such as flight simulators is shown. The need for improved training, involving computers, to help crews cope with integrated control systems and the introduction of expert systems is stressed. Applicability of these techniques to space and underwater domains is possible. ESA

N88-26091# Joint Publications Research Service, Arlington, Va.
LIQUID-PHASE OXIDATION OF ACETONE WITH HYDROGEN PEROXIDE ON OXIDE CATALYSTS
I. I. VASILENKO, N. M. SHEVEL, and YU. YE. SINYAK *In its* JPRS Report: Science and Technology. USSR: Space Biology and Aerospace Medicine, v. 22, no. 1, Jan.-Feb. 1988 p 112-116 23 Jun. 1988 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina, Moscow (USSR), v. 22, no. 1, Jan.-Feb. 1988 p 78-81
Avail: NTIS HC A08/MF A01

Deep catalytic oxidation of organic substances is important to life support systems. When regenerating water in water supply systems for spacecraft crews, it is desirable to effect oxidation of organic impurities in water at a low temperature before formation of end products of the CO2, H2O, etc., type. These requirements limit considerably the range of catalysts and oxidants suitable for such purposes. The oxidative catalytic method based on using molecular oxygen as oxidant involves expenditure of energy for evaporation of water and heating catalysts to temperatures of at least 150 C. It is promising to use hydrogen peroxide, which is a

potent and ecologically pure oxidant for destructive liquid phase oxidation of organic impurities. Use of homogeneous oxidation catalysts is not recommended for water reclamation systems, since this leads to secondary water pollution by heavy metal compounds. For this reason, it is more expedient to oxidize water impurities on heterogeneous catalysts for life support systems of the closed type. This theory is further discussed. Author

N88-26101# Douglas Aircraft Co., Inc., Long Beach, Calif.
PROCEEDINGS OF THE WORKSHOP ON THE ASSESSMENT OF CREW WORKLOAD MEASUREMENT METHODS, TECHNIQUES AND PROCEDURES. VOLUME 2: LIBRARY REFERENCES Final Report, 24-25 Feb. 1987
M. A. BIFERNO and GEORGE BOUCEK, JR. (Boeing Aerospace Co., Seattle, Wash.) Jun. 1987 140 p
(Contract F33615-86-C-3600)
(AD-A191209; AFWAL-TR-87-3043-VOL-2) Avail: NTIS HC A07/MF A01 CSCL 05I

Workload measurement methods of validity, reliability, and applicability are presented. This is a reference of the results of an analysis of a large sample of workload literature. It contains: (1) a listing by author of all references examined, (2) a listing of references by article number, and (3) a fact matrix. The fact matrix provides an index which identifies articles addressing measure reliability or validity and associates them with FAR 25 Appendix D definitions of Workload type. Author

N88-26102 Association pour le Developpement de l'Enseignement et de la Recherche en Systematique Appliquee, Verrieres-le-Buisson (France).
RESEARCH ON PILOTING UNDER CONDITIONS OF BREAKDOWN IN FLIGHT Final Report
D. VIARD Mar. 1987 196 p In FRENCH Sponsored by Direction des Recherches, Etudes et Techniques, Paris, France
(PB87-217980) Avail: NTIS HC E09/MF E09; copy not available from STI Facility CSCL 05H

An experiment on piloting during a breakdown involving 11 simulation sessions on N262 with 16 pilot students at the end of training is described. Objectives: analysis of possible paradoxical reactions and methodological research combining various (variable) aspects including nature of breakdown, individual traits, previous experience, flight process, etc. Conclusions are drawn in particular with respect to the variable contribution of the team members to the work rhythm (linkage), the role of situational attitudes (appreciation of breakdown, reactions to limiting conditions created, etc.), the variability of actions permitted by the complexity and redundancy of the situations, the impact of breakdowns on overall flight planification, as well as on the irregular performance of the execution phases. Author

N88-26103# Stanford Linear Accelerator Center, Calif.
INTRODUCTION TO HUMAN FACTORS
J. M. WINTERS Mar. 1988 10 p Presented at the SHARE Conference, Anaheim, Calif., 28 Feb. 1988
(Contract DE-AC03-76SF-00515)
(DE88-009021; SLAC-PUB-4561; CONF-880233-2) Avail: NTIS HC A02/MF A01

Some background is given on the field of human factors. The nature of problems with current human/computer interfaces is discussed, some costs are identified, ideal attributes of graceful system interfaces are outlined, and some reasons are indicated why it's not easy to fix the problems. DOE

N88-26104*# Old Dominion Univ., Norfolk, Va. Dept. of Mechanical Engineering and Mechanics.
LARGE PLANAR MANEUVERS FOR ARTICULATED FLEXIBLE MANIPULATORS Progress Report, period ended 31 May 1988
JEN-KUANG HUANG and LI-FARN YANG Jul. 1988 29 p
(Contract NAG1-830)
(NASA-CR-183079; NAS 1.26:183079) Avail: NTIS HC A03/MF A01 CSCL 05H

An articulated flexible manipulator carried on a translational cart is maneuvered by an active controller to perform certain position control tasks. The nonlinear dynamics of the articulated flexible manipulator are derived and a transformation matrix is formulated to localize the nonlinearities within the inertia matrix. Then a feedback linearization scheme is introduced to linearize the dynamic equations for controller design. Through a pole placement technique, a robust controller design is obtained by properly assigning a set of closed-loop desired eigenvalues to meet performance requirements. Numerical simulations for the articulated flexible manipulators are given to demonstrate the feasibility and effectiveness of the proposed position control algorithms. Author

N88-26105# Lawrence Livermore National Lab., Calif.
THE RELATIONSHIP BETWEEN SYSTEM RESPONSE TIME, WORKING MEMORY, AND TASK COMPLEXITY: AN EMPIRICAL INVESTIGATION
E. E. SCHULTZ, JR., J. Y. UEJIO, and A. M. DEALVARE 15 Sep. 1987 12 p Presented at the Computer Human Interaction Conference, Washington, D.C., 15 May 1988
(Contract W-7405-ENG-48)
(DE88-000976; UCRL-97342; CONF-880516-3) Avail: NTIS HC A03/MF A01

An experiment tested whether: (1) user performance decrements due to system response time (SRT) results from working memory disruption, and (2) SRT effects vary with task complexity. Subjects performed one- and three-step tasks resembling use of a screen editor while attempting to remember zero, three, or six digits. After each task step, SRT's of either zero, two, or six seconds were imposed. SRT increased task completion time, although more for the complex than for the simple task. There was neither a significant interaction between SRT and memory load, nor a main effect of memory load, showing that SRT does not disrupt working memory. DOE

N88-26807*# Life Systems, Inc., Cleveland, Ohio.
ADVANCED LIFE SUPPORT CONTROL/MONITOR INSTRUMENTATION CONCEPTS FOR FLIGHT APPLICATION Final Report, Nov. 1983 - Jun. 1985
D. B. HEPPNER, M. J. DAHLHAUSEN, and R. B. FELL Mar. 1986 73 p
(Contract NAS2-11758)
(NASA-CR-177378; NAS 1.26:177378; LSI-TR-596-28) Avail: NTIS HC A04/MF A01 CSCL 05H

Development of regenerative Environmental Control/Life Support Systems requires instrumentation characteristics which evolve with successive development phases. As the development phase moves toward flight hardware, the system availability becomes an important design aspect which requires high reliability and maintainability. This program was directed toward instrumentation designs which incorporate features compatible with anticipated flight requirements. The first task consisted of the design, fabrication and test of a Performance Diagnostic Unit. In interfacing with a subsystem's instrumentation, the Performance Diagnostic Unit is capable of determining faulty operation and components within a subsystem, perform on-line diagnostics of what maintenance is needed and accept historical status on subsystem performance as such information is retained in the memory of a subsystem's computerized controller. The second focus was development and demonstration of analog signal conditioning concepts which reduce the weight, power, volume, cost and maintenance and improve the reliability of this key assembly of advanced life support instrumentation. The approach was to develop a generic set of signal conditioning elements or cards which can be configured to fit various subsystems. Four generic sensor signal conditioning cards were identified as being required to handle more than 90 percent of the sensors encountered in life support systems. Under company funding, these were detail designed, built and successfully tested. Author

N88-26808# Midwest Systems Research, Inc., Dayton, Ohio.
A COCKPIT NATURAL LANGUAGE STUDY - SELECTED TRANSCRIPTS Final Report, Oct. 1986 - Dec. 1987
RONALD L. SMALL, DAN E. FLORY, MICHAEL P. MUNGER,

DAVID T. WILLIAMSON, and BRYON T. HOLLIS Apr. 1988 310 p
(Contract F33615-85-C-3623)
(AD-A192972; AFWAL-TR-88-3009) Avail: NTIS HC A14/MF A01 CSCL 01C

This third report on the Cockpit Natural Language (CNL) study contains a brief description of the purpose and methodology of the CNL study, a section on lessons learned, scenario situation descriptions, a glossary and transcripts from 9 of the 54 pilots interviewed. Pilot comments cover the issues and implementation details of automation, displays, voice interaction and artificially-intelligent computer aids. Lessons learned from the CNL study include (1) Voice interaction is best employed as a new channel of information transfer, not just as a backup mode for manual or visual channels. (2) Pilot-cockpit voice interaction requires a shared information context between the pilot and the cockpit's computer in order to ensure that pilot commands are properly understood and executed. (3) Role-playing works (even with a low-fidelity cockpit simulation) when extracting valuable information from a pilot community. And (4), voice-activated computer messages should not replace pilot-to-pilot communications (radio calls, hand signals). GRA

N88-26809# Crew Systems Consultants, Yellow Springs, Ohio.
IMPROVEMENT OF HEAD-UP DISPLAY STANDARDS. VOLUME 1: HEAD-UP DISPLAY DESIGN GUIDE, APPENDIX
Final Report, 10 Oct. 1984 - 15 Jun. 1987
RICHARD L. NEWMAN Sep. 1987 139 p
(Contract F33615-85-C-3602)
(AD-A192973; TR-87-15-VOL-1; AFWAL-TR-87-3055-VOL-1)
Avail: NTIS HC A07/MF A01 CSCL 01D

A design guide for Head-Up Displays (HUDs) has been prepared to assist the HUD engineer by providing in one source a list of design criteria for HUDs. The criteria are based on a review of existing HUD specifications and HUD research. GRA

N88-26810# Katholieke Universiteit, Nijmegen (Netherlands). Psychologisch Lab.
DIRECT MANIPULATION AND THE DESIGN OF USER INTERFACES
P. DESAIN Dec. 1986 41 p
(PB88-126354; REPT-87-FU-01) Avail: NTIS HC E03/MF E01; copy not available from STI Facility CSCL 05H

An approach to user interfaces is described from a cognitive engineering point of view. A model of task representations within the user is given, together with complexity measures of the transitions between the representations. Two main approaches to user interface design are compared: the conversational method and the model world method. Some of their strong and weak points are explained, in connection with their most sophisticated examples; natural languages and direct manipulation, it turns out that in many respects they are complementary to each other. GRA

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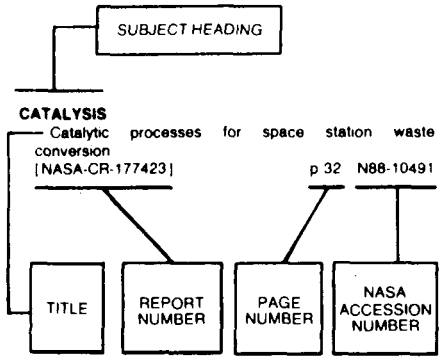

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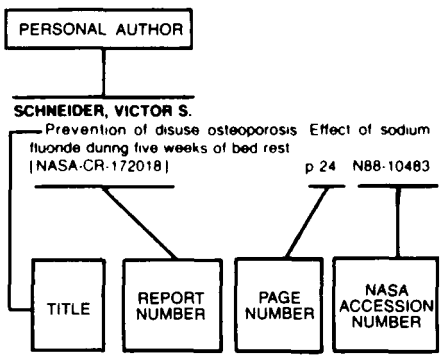

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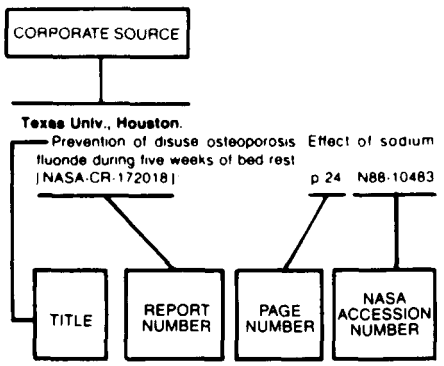

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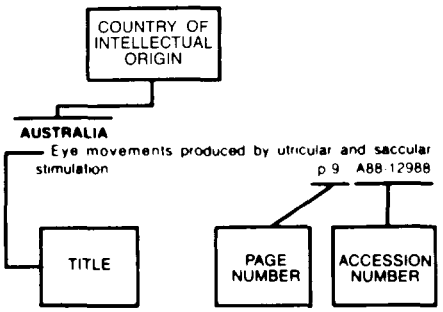

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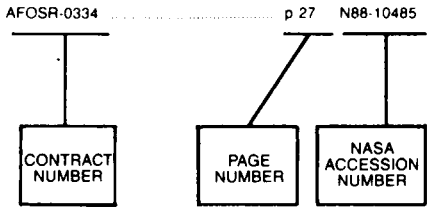

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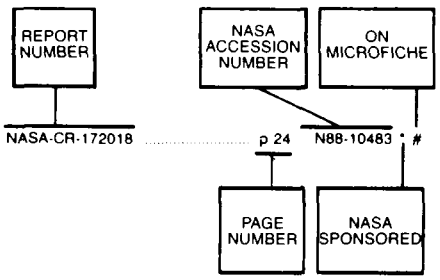

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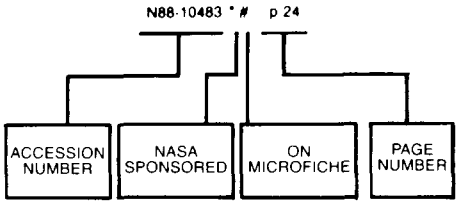

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